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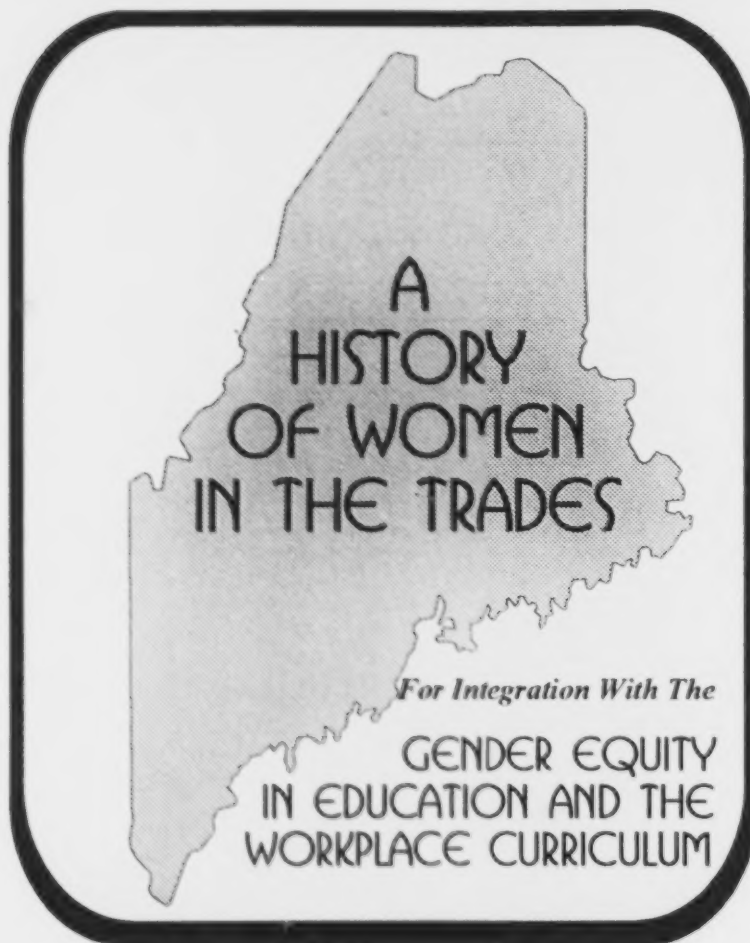
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ABSTRACT

This document, which was originally intended to complement a curriculum titled "Gender Equity in Education and the Workplace," is a compilation of the historical contributions made by women in trade and technical careers that may be used as a source of materials suitable for integration into existing trade and industrial education programs. Presented first are a brief discussion of the importance of gender equity in vocational curricula, a brief biography of the author, suggested strategies for integrating the historical materials into vocational curricula, and a list of particularly noteworthy contributions by women in the trades. Next, historical accounts of the contributions of women in the following skilled occupations/fields from the beginning of the given field (beginning in prehistoric and ancient times when applicable) to the mid-20th century are presented: agriculture; hunting and fishing; manufacturing and processing trades; metal products and heavy industry; lumber and wood products; textiles; leather and fur products; food processing; printing; miscellaneous manufacturing and processing trades; construction trades; architecture; engineering; mining; shipping/water transportation; land transportation/animal or human power; rail transportation; motor transportation; aviation and space; military; and miscellaneous professions (including medical and office occupations). Contains 208 references and a list of significant women and their contributions. (MN)

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INTRODUCTION

Author Comments

When I started working for STEP UP, a skilled trades job training program for women in Vermont, in 1986, I knew nothing about the history of women in the trades beyond "Rosie the Riveter" in World War II. I knew women who were in training or working in the trades, but I had not considered that women might have worked in "men's" jobs in other periods of history or made significant contributions to the trades.

Ronnie Sandler, the founder and director of STEP UP, and a carpenter by trade, believed that tradeswomen need to know their history; that there *is* a history of women in the trades. She presented five historical facts about women in the trades at every recruitment meeting. These five facts were our oral history, and I repeated them myself in other recruitment meetings. This oral history was all we had to tell us that other women had, in fact, passed this way before.

These five facts were brief and bare-boned:

- * Before the American Revolution, women worked in a variety of jobs, including sawyer, grist mill operator, farmer, and printer. Women did whatever needed to be done.
- * Mary Goddard printed the first copies of the Declaration of Independence for public distribution in 1776.
- * Catherine Greene, not Eli Whitney, invented and patented the cotton gin.
- * A woman living in a Shaker Community outside Boston invented the circular saw. She observed that half the motion of a two-man saw is wasted, and conceived of a round saw blade with no wasted motion. She cut a blade from a piece of tin, attached it to her spinning wheel, and created the first circular saw. This invention revolutionized the building industry by making dimensional lumber and stick framing possible.
- * Millions of women worked in the war industries of World War II. They welded, built ships and airplanes, and manufactured munitions. They learned their skills in a short period of time, and proved themselves to be skilled and capable in these "men's" positions. Then they were let go at the end of the war.

That was as much as we knew. Most of it was accurate, with the exception of Catherine Greene and the cotton gin. As discussed in a later chapter, Eli Whitney did indeed patent the cotton gin. Greene acted as his patron and may have contributed to the concept of the gin, but the degree of her contribution remains controversial.

Author Comments (continued)

But oral history carries the aura of myth. As we taught in classes on sexual harassment: if it isn't written down, it didn't happen. A woman working in a regional vocational school in Vermont heard our five facts and posted them on her bulletin board during Women's History month. Several male instructors challenged the claim that a woman invented the circular saw. Prove it, they said, show us where it is written. We didn't know where it was written, but when I undertook this project, I promised her I would find the source. The Shaker Woman was Tabitha Babbitt; her story is told in the section on construction trades.

Through my work in STEP UP, I became a consultant to the Vocational Curriculum Resource Center of Maine as they were developing the Gender Equity in Education and Workplace Curriculum. This curriculum is a monumental piece of work that addresses gender equity issues in all levels of education, as well as business, industry, and policy making. When I began working on the project, however, all that existed was a brief outline of the basic topics to be covered. One item on that outline said "Teach the history of women in the trades." I pointed out to Sue Donar, the project coordinator, and Ed Maroon, the Gender Equity coordinator for the state of Maine, that as far as I knew, nothing had ever been written about the history of women in the trades. There was no one source we could turn to for developing a curriculum unit on this subject. There were bits and pieces of information scattered throughout various books, but nothing comprehensive. Since they were obligated by the original plan to include a unit and nothing was available, they decided to create it. That is the genesis of the history you now hold.

Researching this topic was always an adventure. I contacted everyone I thought might have clues, and received some excellent leads. Extensive searches of library catalogs in Vermont produced a number of sources. I read bibliographies and tried to track down every promising reference. Sue Donar and the Vocational Curriculum Resource Center were very helpful in locating sources through their network of libraries. Others who generously offered leads, references, and copies of materials are Ronnie Sandler, David Noble, Ann Ross, Deborah Hissam, Janice Goldfrank, Lynn Vera, Marcia Braundy, Dorothy L. Bristol and the National Women's History Project, Sandra Frank, Nancy Hoffman, Laura Rose, Women in the Fire Service, Sharon Rose, Edna Primrose, Alice Henry, Bev Kerr, Jean Humez, Darl Schaaff, and Melissa Ireland. Cheryl Curtis read and commented on several drafts and offered invaluable writing support.

There are a number of books that cover one topic in depth - De Pauw's *Seafaring Women*, or Jordan's *The Cowgirls*, for example. Other books cover a period a time, such as Pinchbeck's *Women Workers and the Industrial Revolution*, or any number of books about women in the Middle Ages. These books and their bibliographies were enormously helpful.

I soon discovered that just going into library stacks, pulling books off the shelves, and scanning the indexes - and sometimes the entire book - for women's names provided some of the most tantalizing information. For example, in a two-volume history of the fur trade I found a brief reference to the Aulmus sisters who were fur traders. Other books on the American West provided fascinating tidbits about women gunsmiths and bullwhackers.

Author Comments (continued)

Perusing the stacks was also how I came across excellent sources such as Ehrenberg's *Women in Prehistory* and Scharff's *Taking the Wheel*.

Visiting bookstores and libraries in Oregon, California, and Alaska introduced me to books not readily available in New England. It became clear that there is a vast amount of information published on the subject of women's nontraditional work in various cultures and periods, but most of it is fragmentary. I am certain that the historical archives of every state have photographs, journals, and other records of women who did nontraditional work. The constraints of time and resources demanded that this research rely on secondary, rather than primary, sources. For the same reasons, no claim is made that this survey is exhaustive. There are more references that I wanted to track down, but with the data base growing to over 850 entries, and more than 1000 pages of hard copy, the time came to call a halt.

The goal of this research was to identify contributions made by women in the past in types of work that are now considered nontraditional, or in types of work that were considered nontraditional when the woman made the contribution; and to identify women's participation in nontraditional jobs. "Nontraditional" was defined as work that was of a "blue collar" or manual labor nature, and which is or was dominated by men. There was no limit on the scope of time or place.

Using these criteria, the primary trade areas covered here are agriculture, manufacturing and processing, heavy industry, construction, transportation, and military. Several occupational groups such as hairdressers and office workers are covered briefly because they were at one time considered "men's" work. Several trades-related nontraditional professions, such as architecture, engineering, and medicine are also addressed.

Much has been published in recent years about the contributions women have made in science. Because this information is readily available and much of it falls outside the scope of this work, the contributions of women scientists have been included only when they are directly related to the trade or technology under discussion.

The scope of time covered varies with the trade and the information available. Where possible, information about the work of women in prehistoric and ancient cultures has been included. Most sections cover time periods ending with World War II or the mid-twentieth century.

The cultural and geographic scope was intended to be as wide as possible. The focus on trades and industry resulted in coverage that is heavily weighted toward the areas that underwent the earliest industrialization, specifically northern Europe and North America. Wherever possible, information about women's work in Third World and non-industrial societies has been included.

As the database grew, several themes emerged, revealing common patterns in many unrelated trades. Briefly, these themes are:

Author Comments (continued)

- * Women are capable of doing jobs that require very hard physical labor, particularly if they have grown up being physically active, and their bodies have had a chance to develop strength.
- * Women have worked in nearly every trade - at some time, in some culture.
- * What was considered appropriate work for women varied from culture to culture, throughout time, and often according to class. What was considered "men's" work in one time or place was "women's" work elsewhere.
- * Women's wages have almost always been lower than men's. I found just one case of women's wages being undercut by male workers - the metal/burnishing trade in New York City for a brief period around the turn of the century.
- * Women have often been forced out of work they are capable of doing and want to do. The reasons vary, including men wanting to limit competition during difficult economic periods, cultural beliefs about women's nature and proper sphere, and women being used as temporary labor in times of war and other labor shortages.
- * Protective legislation has often limited women's access to well-paying work. In some cases the legislation was specifically designed to exclude women from specific jobs.
- * When women have entered a previously male occupation in significant numbers, it is often because the job has been de-skilled, that is, broken down into its basic parts. Often technology has contributed by making production easier and requiring less skill. The result is that women get more jobs, at lower pay, with less opportunity to advance or develop skills. At the same time, men who had been skilled workers in that trade may resent women for taking their jobs, when in reality, the nature of the work itself has changed significantly.

As you read the sections that follow, you will see themes played out repeatedly in many trades, times, and places. If the challenge of history is to learn from it and avoid repeating the same patterns in the future, then it is my hope that this history of women in the trades might be of assistance as tradeswomen, advocates, and policy makers plan for the future.

Morgan Grey
Anchorage, Alaska
December 13, 1995

Author's Biography

A long-time advocate for women in the trades, Morgan Grey is the author of *Women's Resources: A Curriculum in Empowerment for Tradeswomen* and *ISTEA on Tap: Drawing Down Funds for Tradeswomen - an advocate's guide to ITSEA*. She is a former coordinator of STEP-UP for Women, a job training program for women in the skilled trades, and was the first coordinator of Vermont's Women and Minorities in Highway Construction. She currently lives in Anchorage, Alaska.



Curriculum Resource Center of Maine

Dear History Publication User:

In the development of the Gender Equity in Education and the Workplace Curriculum, it was discovered that the historical contributions made by women in trade and technical careers did not exist in any one place. This publication has attempted to compile these contributions in one place.

The formidable task assigned to Morgan Grey, the researcher and author, was to develop a historical perspective of women's contributions in the areas of invention and leadership with the emphasis being on "breaking new ground" in the areas of trade and technology. As you look through this document, it becomes clear that Morgan not only accomplished the task, she expanded on it by providing such sections as "Amazing 'Did You Know' Highlights," "Miscellaneous" sections in some occupations, a comprehensive "Bibliography" of all resources used, and a "Reference List" to assist the user in quickly locating specific women.

A History of Women in the Trades is certainly a document that can stand alone to celebrate and to inform individuals about the longevity and the variety of women's contributions to the areas of trade and technology. However, this document was initially created to compliment the Gender Equity in Education and the Workplace Curriculum. It is suggested that numerous tasks addressed in the curriculum may be addressed by utilizing this historical and factual publication. To demonstrate a few integration areas and possibilities, we have included a few integration strategies on the next pages.

As you will see, the possibilities for bringing a historical perspective and integrating history, esteem, empowerment, and workplace respect are endless, and I am sure you will discover many other integration possibilities as you work with this document in conjunction with the Gender Equity in Education and the Workplace Curriculum. Please experiment and make new history!

Happy discoveries,
GENDER EQUITY CORE COMMITTEE MEMBERS

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Suggested Integration Strategies

EXAMPLE 1:

<i>TASK</i>	<i>DESCRIPTION</i>
C-1	Teach History of Women in the Trades

Why students should be taught task C-1

Women have been working in the trades and in technology from the beginning of time, but their contributions have not been documented in history books. For example, many of the first plumbers in Rome were women; a woman was the first printer of the Declaration of Independence; a woman invented the circular saw, which revolutionized the technology of building construction. To counteract the common belief that trades and technologies is "men's" work, this unit will demonstrate that these fields are also "women's" work.

Why Business/Industry/Labor Communities Need to Know More about C-1

Historically and traditionally women have made major and significant contributions to the various trades and industries in our world. This legacy is often ignored or overlooked. The lack of a common understanding of this legacy serves as a barrier for greater involvement and advancement of women in trade and technical careers.

<i>C-1 STUDENT OBJECTIVES</i>
Guidance/Instructors will help students to:
Gain knowledge about women's historical participation in trades and technologies.
Understand the factors contributing to the exclusion of women from these fields.

<i>C-1 BUSINESS/INDUSTRY/LABOR COMMUNITY OBJECTIVES</i>
Leaders will be able to:
Document the roles of women in various industries or trades.
Discuss significant contributions and analyze effect on today's work environment.

<i>C-1 POLICY MAKERS OBJECTIVES</i>
Policy Makers will be able to:
Ensure that instructional materials document the role of women in the history of trades and technology.

Suggested Integration Strategies (continued)

<i>C-1 PARENT OBJECTIVES</i>
Families/parents will be able to:
Understand the roles of women in various industries or trades.
Understand significant contributions of women and their effects on today's work environment.

Suggested Integration Strategies (continued)

EXAMPLE 2:

<i>TASK</i>	<i>DESCRIPTION</i>
A-1	Instill Self-Esteem and Empowerment

Why Students Need to Be Taught A-1

A person's level of self-esteem affects everything she or he thinks, says, or does. It affects how she or he sees the world and her or his place in it, and how others see and treat her or him. Self-esteem affects the choices one makes about what to do in life and with whom to associate. It affects the ability to take actions to change things that need changing. Therefore, knowledge of one's self-esteem is extremely important when making career decisions.

Why Educators Need to be Concerned with A-1

Same paragraph as the student section, plus. . .

Because you are an Educator and work closely with students, your own self-esteem serves as a model. If your self-esteem is high it will provide a positive model. If your self-esteem is low, you model low self-esteem to your students. Understanding and projecting your own positive self-esteem will enable your students to improve their self-esteem.

Why Parents Must Know about A-1

Same paragraph as the student section, plus. . .

Your self-esteem serves as a model for your children. If your self-esteem is high, it provides a positive model for your children. If your self-esteem is low, your children will experience low self-esteem. Understanding and projecting your own positive self-esteem enables your children to improve their self-esteem.

Parents recognize the fact that growing up is a lifelong process as is the development of one's self-esteem. Throughout life, everyone experiences different levels of self-esteem on any given day. However, as parents, we must instill the value for and the need for a positive self-esteem and the recognition that development of self-esteem is a lifelong endeavor. This can only be achieved through continual parental involvement in the development of a child's success.

Empowerment results when a child has developed a positive self-esteem.

Suggested Integration Strategies (continued)

<i>A-1 STUDENT OBJECTIVES</i>
Guidance/Instructors will help students to:
Define self-esteem.
Describe impact of self-esteem.
Identify factors that influence developing self-esteem.
List self-esteem improvement methods.

<i>A-1 EDUCATOR OBJECTIVES</i>
Educators will help students to:
Define the language of self-concept.
Define the language of self-esteem.
Define the language of empowerment.
Identify self-esteem and empowerment blockers.

<i>A-1 PARENT OBJECTIVES</i>
Families/parents will help children to:
Develop responsibility and accountability.
Make responsible choices and decisions.
Accept consequences for decisions and choices.
Develop assertiveness.

Suggested Integration Strategies (continued)

EXAMPLE 3:

<i>TASK</i>	<i>DESCRIPTION</i>
I-6	Teach Respect in the Workplace

Why Students Need to Be Taught I-6

Every worker has a right to be treated fairly, equally, and respectfully in the workplace. A person enters the workplace with diverse knowledge, skills, abilities, values, and life experiences. This diversity is shaped by the ethnic, cultural, religious, and social backgrounds. The varied backgrounds and strengths that each worker brings to the workplace enhances the workplace by creating a stronger and better working environment. Through understanding and accepting differences, every worker can define a working environment, free of discrimination, harassment, and disrespect.

Why Business/Industry/Labor Communities Need to Know about I-6

Current and future jobs will require high skill levels. Productive employees have a range of skills, technical knowledge, analysis, communication, and workplace behavior. Not all employees exhibit these skills. They may need training in these areas.

Appropriate behavior is determined by safety concerns, type of work duties, and workplace culture. Research shows that productivity increases when employees work as a team and appreciate/recognize individual differences and strengths that can be used to complete an assignment.

Every worker has a right to be treated fairly, equally, and respectfully in her/his workplace. People enter the workplace with diverse knowledge, skills, abilities, values and life experiences. Through understanding appropriate workplace behavior, employees will contribute to increased productivity.

<i>I-6 STUDENT OBJECTIVES</i>
Guidance/Instructors will help students to:
Understand why people are treated disrespectfully in the workplace.
Identify what a respectful workplace looks like.
Learn how to promote respect in the workplace.

Suggested Integration Strategies (continued)

<i>I-6 BUSINESS/INDUSTRY/LABOR COMMUNITY OBJECTIVES</i>
Leaders will help workers to:
Obtain information on what appropriate standards and expectations should be for appropriate workplace attire, gender positive team building skills, respect in the workplace, safety skills and rules, worker rights and responsibilities, and how to balance work and family.
Set workplace standards and expectations for behavior in these areas.
Communicate these standards and expectations.
Monitor behavior.
Receive and provide feedback.

Amazing "Did You Know" Highlights

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A G R I C U L T U R E



Agriculture

Prehistory: The Invention of Agriculture

Ancient myths point to women as the inventors of agriculture. The Egyptian goddess Isis, for example, was said to have discovered agriculture and planted the first grains, and the Roman goddess Ceres was said to have introduced the plow.¹ Po Ino Nogar, a goddess of the Cham of Cambodia, created rice; Uti Hiata taught agriculture to the Pawnee; and the Wawalag Sisters of Australia domesticated plants.² Underlying these and other myths may be the truth of women's contributions to agriculture, for "anthropologists now generally concede that women invented agriculture."³

Margaret Ehrenberg, in *Women in Prehistory*, details the invention of agriculture as a probable development of foraging, a food-gathering activity most often performed by women in hunting and gathering societies.

The discovery of farming techniques has usually been assumed to have been made by men, but it is in fact very much more likely to have been made by women. On the basis of anthropological evidence for societies still living traditional foraging lifestyles and those living by simple, non-mechanized farming, taken in conjunction with direct archaeological evidence, it seems probable that it was women who made the first observations of plant behavior, and worked out, presumably by long trial and error, how to grow and tend crops.⁴

The shift from foraging to farming appears to have started in the Near East around 10,000 BCE, and marks the transition from the Paleolithic and Mesolithic (Old Stone Age) to the Neolithic (New Stone Age). "By 6000 BCE farming was well established throughout that part of the world. From there the ideas and skills of agriculture spread throughout Europe."⁵

Because tools are invented by the people who recognize the need for them, Ehrenberg also credits women with the invention of "all the vital concomitant inventions associated with it, such as the hoe, and storage and preparation procedures."⁶ In fact, agriculture can be credited with inspiring – or necessitating – the invention of most basic technologies.

Tools used by foragers must be either light enough to carry around or simple enough to be made as and when they are required, and then discarded after use. If, on the other hand, they can be kept and looked after, more effort can be expended on their manufacture. Early agricultural tools would initially have included such things as pointed sticks for making holes in the ground for sowing seeds, and stone querns for grinding grain into flour. As women were discovering the need for this equipment, so they, rather than men, would have solved the problems and invented the

necessary tools. While prehistoric foraging women might have used skin bags to carry the plant foods they had gathered back to their base, just as their modern counterparts do, horticulturists would have needed more solid containers for keeping food in their houses, but which they would not have had to carry around. Carved wooden vessels may have been used, and pottery has been used by most horticultural societies, both past and present, but rarely by foragers. Indeed, because it is usually so well-preserved on archaeological sites, pottery is often the first thing an archaeologist will mention when discussing a site or period. It was invented in south-west Asia, in the same areas in which farming was first practiced, but probably several hundred years after the people had become accustomed to a sedentary lifestyle. As pottery was probably used initially for storing cereals, or for cooking plant foods, both of which were within women's sphere of activity, women are more likely than men to have discovered the processes of molding clay and then firing it.⁷

The consequences of the shift from foraging to farming were far-reaching. Ehrenberg calls the domestication of plants and animals "one of the most momentous changes in the history of the human species," and comments that

The social consequences of the switch from foraging to agriculture would have been as far-reaching as the economic consequences, but not all the implications of this change would have been realized for many generations or even centuries. The transition from foraging to farming would have made profound differences to nearly all aspects of the lifestyle of prehistoric women and men. Rather than moving around in search of food, the discovery of agriculture allowed, or perhaps necessitated, a sedentary lifestyle. It would also have given rise to, or perhaps was precipitated by, an increase in the size of the population.⁸

Women in foraging societies traditionally have high status because they are the primary providers of food for the community.⁹ This high status continued into horticultural societies. In the Neolithic society of Catal Huyuk, which grew to prominence during the 7th millennium BCE, and was located in what is now modern-day Turkey, "the economic role of women was crucial. They cultivated an amazing variety of indigenous plants for food and medicine."¹⁰ Women were also preeminent farmers in Minoan Crete (3000-1500 BCE).

Crete was renowned for growing fruit, and orchard cultivation became increasingly important as the produce from olive, grape, fig, and apple trees was traded abroad, as well as consumed locally. This helps explain why the tree, usually shown associated with women, is considered sacred and is so prevalent in Minoan religion. Again and again, women are shown, on rings and seals, tending fruit trees.¹¹

Despite women's preeminent role as the inventors of agriculture and the high status accrued to them in foraging and horticultural societies as the primary food producers, agriculture in more developed societies is primarily a male activity, and women generally have low status. What happened?

Ehrenberg attributes the later development of agriculture, which had originally been a positive force for women, with women's eventual loss of status in most agricultural societies. In answering the questions of why the change and when it happened, she explains:

Two facts are certain: firstly, by the time of the earliest written records, everywhere in Europe farming was primarily a male occupation, and men owned the farmland and the tools. Secondly, in those areas of the world where women are still the main agricultural producers, most of the farming is concerned with crop production, and if animals are kept at all, it is usually on a small farmyard scale, rather than as large herds or flocks. The change to male dominance in agriculture, therefore, took place at some time between the first stages of the Neolithic period and the advent of written records, and may be related to the changing role of animals within the farming economies of prehistoric Europe. It also seems likely that such a drastic shift in lifestyle, whether it took place gradually over millennia or as a sudden "revolution", would have been associated with other changes within society. Anthropologists have shown that in present-day societies a significant (though not 100 percent) correlation exists between plough agriculture and patrilineal descent and land ownership in the same way as there is a correlation between non-plough agriculture and the heavy involvement, and consequent enhanced status, of women....

The crucial changes in farming practice are thought to have taken place around 3000 BCE, in the later Neolithic period. This would have been some five millennia after the introduction of farming in the Near East, and similar economic shifts can be detected in many areas of Europe at about the same time. Andrew Sherratt has suggested that although domesticated animals were kept during the early Neolithic, they were used only as a source of meat; the consumption of milk or milk products was probably not significant, nor were the animals used for pulling ploughs or carts. All these innovations came later and not only revolutionized agricultural productivity, but also reduced the amount of labor involved in farming. Moreover, the greater importance of domesticated animals and their products would have reduced the necessity for hunting wild animals. As the balance of work changed from part hunting, part crop cultivation and tending a small number of animals to an economy dependent on mixed farming, so the roles and duties of women and men may have shifted.¹²

The scale of animal herding appears to be a significant determinant of women's level of participation in agriculture, and their level of society in general. This is related to what has been called the "secondary products" revolution. Ehrenberg explains that

Although in pastoral societies (those which depend exclusively, or almost exclusively, on animal herding) the division of gender roles between tending, milking and the processing of animal products is more varied, when animal husbandry is part of a mixed farming regime, as it seems to have been in Neolithic Europe, the involvement of women often seems to depend on the scale of herding. When only a few animals are kept, women often tend and milk them, in addition to other farming tasks, while men continue to hunt. In full-time mixed farming communities, where herding is a large-scale activity, such as is postulated for post-"secondary products revolution" Europe, men tend to be more involved in herding and milking, often leaving women to process milk into cheese and yogurt.

The innovations of ploughing and the extensive use of the secondary products of animals, involving milking and spinning and weaving, bring in their train many other important new tasks. Ploughs have to be made and maintained, and animals trained for the job from a young age. Milking needs to be done regularly, and milk processed, often in specially made equipment. Sheep have to be plucked. Herds must be fed or tended in suitable pastures, and given access to water. Spinning and weaving wool into yarn and then textiles is especially time-consuming, though it can be carried out at the same time as other tasks, such as looking after children. So the range and amount of work added by these innovations is not inconsiderable, particularly if added to the already substantial amount involved in arable agriculture, let alone child-rearing, even if each one of these tasks is carried out on only a small scale. By the third millennium, farming and food production would have changed from a comparatively small series of tasks which one woman, or a group of women, could have performed with comparatively little equipment, to a series of complex operations which would have been a full-time occupation for the whole population....

The "secondary products" which develop in the later Neolithic all center around the greater importance of animals, particularly cattle and sheep, within the farming context.... They mark a change from horticulture to intensive agriculture, in which the herding of animals directly for food, for the secondary products which derive from them and for their additional use as traction animals, is as important a part of the agricultural work of the community as arable farming. If the few artistic representations of the later Neolithic and subsequent prehistoric periods can be used to suggest that men now became more involved in agriculture, this can be backed up by a consideration of gender roles in societies with a similar economic base which have been described in the anthropological literature.

In areas of the world where plough agriculture and the herding of animals are the predominant form of farming, men universally play the major role in agricultural tasks. Women either take no part in farming or only a small one. They may sometimes contribute to harvesting, or to the care of domestic animals, if these are kept only in small numbers. An important distinction exists today between Africa, where horticulture predominates, and Asia, where plough agriculture is far more common and where domesticated animals are kept. Even in those areas of Asia, for example, where women are involved to some extent in

aspects of plough agriculture, they work fewer hours than men; whereas in Africa, where farming is predominantly carried out without the use of the plough, and primarily by women, they do far more work than men.¹³

How such fundamental changes actually took place is not clear, even if we assume they were a gradual process in each community. The full consequences which have just been discussed would have developed very slowly, even over millennia, and are difficult to pinpoint chronologically. In any case, as women were increasingly relegated to secondary tasks, by the end of the Neolithic period they had fewer personal resources with which to assert their status. Presumably, as with so many innovations even in the modern world, the social and economic consequences of seemingly minor innovations would not have been apparent until it was too late to return to former *mores*. The discovery of agriculture, which at the beginning of the Neolithic had been such a positive step by women, was by the end of the period to have had unforeseen, and unfortunate, consequences for them.¹⁴

While Ehrenberg's explanation does not adequately answer the question of *why* gender roles developed as they did, it does outline the economic changes that appear to have accompanied – or precipitated – the drastic loss of status women have experienced in most agricultural (and by extension, industrial) societies. It is likely that we will never know precisely what caused the change.

It can be argued that greater upper body strength is needed to handle a primitive plough. Perhaps, but as will be seen in later sections, women in many periods and societies have regularly performed hard physical labor. The upper-class Victorian notion of the delicate lady, who is to be sheltered and protected from the harsh realities of the world outside the family, and whose reproductive function would be compromised by physical exertion, is a recent construct that gained popular acceptance in the mid-1800s and continues to influence gender role stereotypes. The myth of the lady and the reduced need in modern western society for physical strength have resulted in women who are generally lacking in physical strength, which then reinforces the assumption that women are incapable of significant strength and physical labor. But when raised in societies where women are expected to be physically active and strong, they are.

Despite their relegation to the periphery of agricultural work, women have actively participated in the industry throughout history. The remainder of this chapter will examine women's participation in, and contributions to, agriculture.

Ancient

In ancient Egypt (2650 - 1070 BCE), every Egyptian was required to perform temporary labor, called corvee duty, for the state. This labor might consist of public

works such as dam construction, or field labor. Women as well as men are named on the lists of field laborers, but it is not known if they performed the same types of labor. If a person attempted to escape the labor requirement, their family was pressed into service in their place. In one record, a scribe tells his apprentice that "I was imprisoned in the temple whilst my father and mother were in the field as well as (my) brothers and sisters."¹⁵

It appears that some Egyptian women owned farmland, and in some cases may have farmed it themselves:

Women were able to own or rent land and farm it, perhaps to provide a livelihood, perhaps as a means of investing surplus wealth. The *Wilbour Papyrus*, dating to the reign of Ramses V [1156-1151], is concerned with grain production on state-owned land that is leased out to tenants....[A]bout 10 percent of these are women. The only title they are given is "citizeness".... Tenants might employ a cultivator to do the work, and in two cases, the tenant, a scribe, had the land cultivated by a woman. Another document speaks of grain "from [the house of] the lady Rokha (?) from the farm-land that [she] tilled...." It is possible that some women were actually involved in working the land.¹⁶

Some Roman women farmed as well. Lefkowitz and Fant quote the following reference to a woman farmer who had died: "Valeria Maxima, owner of a farm, dearest daughter of Valeria, who lived 36 years, 2 months, 12 days, on her farm in the district of Mandela in the precinct of Hercules, rests in peace."¹⁷

Europe, to 1900

While agriculture may have been dominated by men, women were widely engaged in agriculture and husbandry up to the nineteenth century. It would be fair to say that virtually all rural European women were engaged in agricultural activities to some degree. "In this predominantly agrarian economy," wrote Kathleen Casey, commenting on England from the eleventh through fourteenth centuries, "women provided at least half the labor power."¹⁸

During the Middle Ages, several classes of women were involved in agricultural work. The first was the wife and female family members of the farmer. Some historians describe the wife's range of responsibility as focused on the household's "inner economy," consisting of activities performed in or near the house, such as cooking, spinning, weaving, brewing, and tending the garden and yard animals, while the "outer economy" of the men was primarily farming and tending herds.¹⁹ As David Herlihy comments, however,

the precise range of the woman's inner economy was flexible, expanding or contracting in relation to whether the man had assumed other functions which might keep him from the home for lengthy periods or make him

disdainful of agricultural labor. If we are to believe Tacitus' picture of the family life of the Germanic freemen on the eve of the invasions, the "best and bravest" of them left even agricultural labor to the women and made their contribution to the family fortunes by raids and wars.²⁰

Indeed, records show that the "inner economy" of women covered a wide range:

In the country, wives and daughters and servants assisted in all farm tasks. Not excused from the heaviest field work, women mowed, weeded, raked hay, pitched dung, sowed, harvested, and gleaned. They herded livestock, cared for poultry and gathered the eggs, milked cows and carted pails, planted and processed flax and hemp, which they washed, beat, spun, and wove to make shirts and table goods, sheared the sheep and spun and wove wool for cloaks and blankets, and tended the kitchen garden for herbs and vegetables which they then cooked.... [S]ixteenth-century ... Anthony Fitzherbert described a wife's responsibilities in his *Boke of Husbandry*: "It is a wyves occupation to wynowe all maner of cornes ... to make heye, shere corne, and in tyme of nede to helpe her husbnde to fyll the muck-wayne or donge-carte, dryve the ploughe, to loode heye, corne and such other." The extent of the wife's labor can be estimated from the allotment of land to colonists: twice as much to the married as the unmarried – who but the wife would perform the labor on the additional land?²¹

Richard Vann suggests that the farm wife

probably worked even harder than her husband, who had at least some seasonal respite from working in the fields. There was little that she did not do in the fields herself: reaping, threshing, collecting and spreading dung, and even plowing were all tasks that women performed. Peasant women were considered neither weak nor delicate.²²

Some women were land holders in their own right. Some held the land by inheritance or dower, and court registers of land sales reveal that other women purchased land themselves. Poll-tax returns for the West Riding of Yorkshire, England, in 1379, show two women farming independently. On the continent, an example of an independent woman farmer

was a peasant women from Montailous, who, as a Cathar, was forced to flee her village for fear of the Inquisition. She moved to San Mateo in the Tarragona region and succeeded in purchasing a house and farm there which included a vineyard, a mule and a herd of sheep. In a small workshop in her home she dyed wool. In the busy harvest season she worked as a hired laborer with her children.²³

The third group of agricultural women was laborers who worked for wages. Some were unskilled; others, such as dairy overseers, were highly skilled. Women laborers formed

a valuable reserve at harvest time, or when a sick tenant had to hire a substitute to perform his labor services for the lord. They did much the same work as the men: haymaking, weeding, thatching, mowing, reaping, and binding. Sometimes they lived in the village, in cottages, or as lodgers in other people's houses. Sometimes they formed part of the floating population that roamed the country at harvest time.²⁴

Whatever the tasks, it appears that women always earned less than men for the same work. An English twelfth-century manual of husbandry written by Walter of Henley called women "half men," justifying their lower wages by reasoning that they "worked more slowly at jobs considered less valuable."²⁵ The English parliament in the 1563 Statute of Artificers set women's wages at one-third to one-half of men's, "even though they worked the fields the same number of hours, at jobs just as arduous."²⁶ Not only were women paid less than men, they were fed less, as well.

In Germany, female vineyard workers were to receive soup and vegetables for breakfast, milk and bread for lunch, and no supper; men, in contrast, were to receive soup and wine for breakfast; beer, vegetables, and meat for lunch; and vegetables and wine at night: an ample supply of both protein and alcohol.²⁷

One of the few periods in which women's wages came close to men's was in the late Middle Ages during the years of the Black Plague. The plague wiped out nearly one-third of Europe's population,²⁸ causing labor shortages. During this period, "the female grape pickers of Languedoc made four-fifths the wage of men, when usually they received only half as much."²⁹

With the eighteenth century came major changes in the organization of agriculture in England, and women were severely affected. The process of enclosure, which privatized formerly public land, robbed many poor people of their subsistence rights. The trend toward bigger and more specialized farms and new farming techniques crowded out many small land holders. As a result, peasants were displaced from land that they had once farmed, and many moved to the cities to form the labor force needed in the newly industrialized factories.

Toward the end of the eighteenth century, many rural women were forced to become agricultural day laborers. The work was seasonal, and most of these women had to find other means to supplement their incomes. In Shropshire, England, women worked in the coal mines in the winter, and were agricultural workers during the growing season, when many of them left home for the markets of London.³⁰

Pinchbeck notes that "among the occupations in which women were employed no task was considered too heavy or distasteful. As servants in husbandry women performed the heaviest kinds of agricultural labor."³¹

Many of the new agricultural methods required labor-intensive cultivation, which resulted in new jobs for women when it was recognized that they could be paid significantly less than men for the same work. Given that the men's wages were generally too low to support a family, women's wages must have been low indeed. One woman farm owner wrote, "my farm contains six hundred acres. As I now consider it an amazonian land, I affect to consider the women as capable of assisting in agriculture as the men. They weed my corn, hoe my turnips, and set my potatoes; and by these means promote the prosperity of their families."³²

Women and girls also worked the harvests, joining roving groups of workers who went from field to field.

Although the work was strenuous and carried on through long hours, the harvest field was always associated with fun and merry making, and women who were at other times engaged in industrial work regarded this season as "a relaxation to domestic confinement and less agreeable employment." Women as well as men were to be found in the companies of migratory harvesters, who invaded thinly populated areas where wages were likely to be higher than elsewhere....

The actual work done by women at harvest time varied according to the custom of the locality and their occupation during the rest of the year. In the North and West, where women did a great deal of the ordinary agricultural work on small holdings, they shared the heaviest labors of the harvest field. In Yorkshire and Lancashire nearly all the reaping was done by women at considerable savings to the farmer, since women's wages were only half, and sometimes less than half those paid to men for the same time.... In some parts of Scotland and in Carmarthen and Pembroke, the discrepancy in wages was not so great; the fact that "a good stout woman" could "reap very nearly as much as those men that come to the harvest," was acknowledged by a difference of only 2d. a day between the wages of a man and woman....³³

In other regions, where most women were employed in less strenuous occupations, such as spinning, lace making, and straw plaiting, "the majority took a less strenuous part at harvest time, and did the lighter work of raking, gathering and gleaning."³⁴

The new agricultural societies kept records of harvests, and sometimes offered prizes for harvest work. These records show that

the amount a woman could reap alone in any one harvest seems to have averaged between six and eight acres. The Bath and West of England Society in 1800 awarded two guineas to Philadelphia Bateman for reaping eight acres of wheat, and one guinea to Sarah Cook for seven acres one rood. Since on an average a woman reaped about a third of an acre a day this was probably as much as she could accomplish while the harvest lasted. The prize of one guinea awarded by the same society to "Mary Edwards, a

young woman of sixteen, for meritorious labor in harvest," shows the early age at which women undertook this strenuous work.³⁵

Middle- and upper-class women joined in the agricultural revolution as new farmers/land owners. As in earlier times, some inherited their farms; some purchased them independently. The agricultural revolution of the late eighteenth century was characterized by larger farms and experimentation with new methods of farming. Pinchbeck notes that

In this "rage for agriculture" the women of the period were not to be left behind. Many of them threw themselves whole-heartedly into the new interests. They studied, subscribed to, and some of them contributed to, the agricultural publications of the day, while members of the aristocracy in the van of fashion started their own experimental farms on which they tried the new cultivations. There is ample evidence to show that some of the women farmers were keenly interested in experiments and improvements; some of them were known as being among the foremost of the improving farmers in their districts and as achieving no small measure of success in their work.³⁶

The awards made to women by the new agricultural societies at the end of the eighteenth century when agricultural improvements were beginning to be more widely adopted, give abundant evidence of the interest and experiments of a large number of successful women farmers.³⁷

The extent to which women personally undertook the supervision of their farms and the carrying out of experiments, is shown best perhaps, by an examination of some of their agricultural correspondence. The following letter, which was published in the *Annals of Agriculture*, gives an excellent idea of the thoroughly practical way in which one woman undertook to set "an example to the farmers" of her neighborhood:

Sir,

I would very much thank some of your ingenious correspondents, if they would point out any successful means of destroying fern. I have succeeded in improving pasture land in so short a period of time, as to surprise my neighborhood, which consists of very slovenly farmers, tho' in a populous part of Gloucestershire.

I bought a small estate, and took possession of it in the month of July, 1803. I mowed the crop immediately, and had only nine ton of hay off fifteen acres, and it was so full of weeds, rushes, mints, etc., that my horses would not touch it. I found the land not only poisoned with springs, but full of great rocks, laying above ground, and partly covered with thorns, orles, old stumps of trees, etc.; added to this there was scarcely the vestige of a fence. I had the rocks blown up, broken small, and laid in the drains: all the trees grubbed up. I had 576 perches of under-drains made, and as much open ditching, besides a large ditch under every hedge. I grubbed close to the hedge-rows, and sowed hayseed. This work was all concluded, and the ground cleared, by the end of March. In July following, I mowed the fifteen acres, and had thirty ton of hay, all of the best herbage. The next winter (1804), I dressed the land with dung, and my crops continued to improve. My fences are now all made, and I have planted 4,000 quick plants in the dead places, besides elms in the hedge-rows, etc. I have still eight acres to improve,

which I have not yet undertaken, as the quantity of fern has rather discouraged me. I was directed to mow the fern, which I have done, without finding it at all decrease.

As a woman undertaking to farm is generally a subject of ridicule, I bought the small estate by way of experiment: the gentlemen of the county have now complimented me so much on having set so good an example to the farmers, that I have determined on taking a very large farm into my hands; and perhaps my present communication be thought worthy of reception, I may perhaps in future, be tempted to address you again. The paragraph in your *Annals* of this month respecting Grass Improvements, encouraged me to ask information about fern,

I remain, Sir, your obedient servant,

E.G. ³⁸

Women and girls continued to work regularly in the fields until the early 1800s. By 1843, they were absent from the fields, as revealed by the testimony of a witness before a parliamentary commission who said, "I remember formerly when girls turned out regularly with the boys to plough, etc., and were up to the knees in dirt, and in the middle of the winter, in all kinds of employment. Now you never see a girl about in the field."³⁹ Tilly and Scott suggest that rising standards of living made it less necessary for women to do field work,⁴⁰ but Oakley suggests that the connection between the rising emphasis on housewifery as women's proper role and attempts to restrict women's employment options⁴¹ may also have contributed to the disappearance of women from the fields in nineteenth century England.

A Madame Lefebvre, of Paris, made a unique, though widely forgotten, contribution to agriculture in 1859 when she patented a process for making nitrates out of nitrogen gas. She obtained the patent in England, where it was ignored. By the 1920s, however, the process had been re-discovered and millions of tons of nitrogen fertilizer were being used annually by American agribusiness.⁴²

Native Americans

Native American women of many tribes made significant contributions to agriculture worldwide. In many tribes, it was the women who were responsible for cultivating the crops which formed the basis of their diet, and they developed many varieties of food crops now grown around the world. Rayna Green credits native women of many tribes throughout the Americas with the development of "all the extraordinary varieties of vegetables and fruits used by Indian peoples. Among them were corn, beans, squash, potatoes, peppers, sunflowers, tomatoes, and plants from which dyes and medicines were made. Some of these plants make up many of the major food crops in the world today."⁴³

When Europeans first arrived in North America in the sixteenth century, many native peoples such as the Iroquois were living in organized villages of 2,000 people or more,⁴⁴ and supporting themselves by a combination of hunting and farming. In the eastern region – with the exception of northern Maine, where the growing season is too short⁴⁵ – vegetables were the center of their diet, with some supplementation by meat obtained by hunting. It was the women who did all of the farming, from planting to

harvesting and food storage and preparation. The only contribution by men was to clear the land, and that varied from tribe to tribe.

The Iroquois had settled in one area for over three centuries, where they developed their cultivation techniques, growing the "three sisters" – corn, beans, and squash. According to Eleanor Leacock, Iroquois women planted 15 varieties of corn, up to 60 different kinds of beans, and 8 types of squash.⁴⁶ "Patriot soldiers who penetrated into Iroquois country in 1779 were amazed at the extensive acreage the Indian women had under cultivation."⁴⁷ In addition to their cultivated crops, Iroquois women also collected wild fruits, nuts, roots, and plants for both food and medical uses.

Because they provided the greatest part of the food supply for their tribes, the women of many tribes were accorded high status. In 1788, Domine Pater, a Seneca-Cayuga orator, spoke to the Governor of New York on behalf of his people. His speech made clear the high position of women:

Our ancestors considered it a great offense to reject the counsels of their women, particularly [that] of female governesses. They were esteemed the mistresses of the soil [as they attend to the labors of agriculture]. Who, said they, bring us into being? Who cultivates our land, kindles our fires [or administers to the calls of the hungry], but our women?⁴⁸

Carolyn Niethammer, in her groundbreaking book *Daughters of the Earth*, described the work of Seneca women farmers:

Seneca women worked together in the fields under the direction of a field matron, generally a respected older woman whom they all elected in the spring and agreed to obey. They started work in one woman's field, labored there until the necessary tasks were completed, and then went on to another woman's field. It was the field matron's job to see that all the women worked together so there would be no complaints that some of the women had had to work harder than others. She also supervised the rest periods when the women sang, played games, and told stories. Harvesting, too, was a communal effort. Each mutual-aid society divided into three groups: the first group husked the corn and threw the ears into baskets, others carried the corn to the storage places, and the rest of the women cooked a feast for the field workers.⁴⁹

Native American women developed practical methods for aiding the success of their crops. For example, Huron women assisted germination by soaking seed corn in water for several days before planting, and they circumvented the late spring frosts common in the Northeast by planting squash seeds inside their longhouses in bark trays filled with powered wood.⁵⁰

In the midwest, Pawnee women were also responsible for the crops. However, the Pawnee led a migratory lifestyle quite different from the settled villages of the Iroquois and other Northeastern tribes. Pawnee women planted their crops in the spring and tended the fields until the plants were mature enough to grow on their own. Then the

tribe began its annual summer migration following the great herds of buffalo. The women were responsible for setting up camp, then striking and packing it whenever the small hunting groups moved to new locations, and they tended all the meat and hides provided by the hunters. In the fall, the small groups gathered again into villages in time to harvest the crops that had been growing all summer. According to Niethammer, "the women directed the harvesting, but everyone helped with the work – bringing the crops in from the fields, roasting the pumpkins and cutting the flesh into long spirals, winnowing the beans and separating them by color, and most important of all, roasting, husking, and drying the corn."⁵¹

The Hidatsa women of North Dakota and Minnesota were also responsible for the agricultural work of the tribe. Gilbert Wilson, an anthropologist who lived with the Hidatsa in the late 19th century, recorded many details of their lives. In *Agriculture of the Hidatsa Indians* he quoted the stories told him by Maxi'diwiac, also known as Buffalobird-Woman. She described the women's work in the fields:

My mothers and my two grandmothers worked at clearing our family's garden. It lay east of the village at a place many other families were clearing fields.

I was too small to note very much at first. But I remember that my father set boundary stakes – whether wooden stakes or little mounds of earth or stones, I do not now remember – at the corners of the field we claimed. My mothers and my two grandmothers began at one end of this field and worked forward. All had heavy iron hoes, except Turtle, who used an old fashioned wooden digging stick....

As I grew up, I learned to work in the garden, as every Hidatsa woman was expected to learn.... The planting season having come the women of the household planted the field in corn.... While the corn was coming up, the women worked at clearing out the roots and smaller stumps between the hills.⁵²

Navajo women in the Southwest earned their high status not from farming, but from their ownership and management of livestock, which also afforded them a high degree of economic independence. The Navajo began raising sheep and goats soon after they had been introduced by the Spanish, who had brought the animals for food. While some men owned flocks of sheep, it was women who had the primary responsibility for the safety and management of the animals. According to Niethammer,

Sheep herding is not an easy job, and the Navajo woman who was successful had to express an abiding concern and an intense identification with her flocks. While a woman might send a child to take a flock out to graze on an ordinary day, when it was time for lambing she strove to provide each laboring ewe and each tiny lamb with her individual attention. No matter if the sheep all began dropping their lambs in the middle of an unseasonable blizzard, the Navajo woman was right there with them in the middle of the snow and sleet, even sleeping in the corral so that she could

be close enough to assist with difficult births. The Navajo woman knew most of the sheep in her flock as individuals from the moment of their birth, through each lambing season, through each shearing, when she gathered their wool for the rugs she would weave, until the day she butchered them and they ended up in her cooking pot.

The Navajo woman had and still has complete control over the management and disposal of any of her property and livestock, and some women accumulated more wealth than their husbands. Theoretically it would have been possible for a woman who was a good livestock manager to become very rich. Yet the Navajo woman, as an integral part of her social structure, would not consider retaining any of her wealth for her exclusive use.⁵³

American Colonies

In the colonies during the seventeenth and eighteenth centuries, European women as well as men arrived in search of new lives and opportunities. Many women arrived as indentured servants, their transportation paid by a landowner or tradesperson in exchange for a term of service. Indenturing carried no stigma, and at the end of the term of service, the servant became a free person. During the time of the indenture, the servant was not allowed to marry, and one who became pregnant would find that her term was extended to compensate the master for labor lost during the pregnancy. It was not unknown, however, for an unscrupulous master to make a servant pregnant in order to extend her term. Female indentured servants normally did the work of the women in the household, in the dairy, the kitchen garden, and within the home. They rarely worked in the fields.⁵⁴

In some cases, free women arriving on the shores of North America were able to create independent lives, especially in the earliest days of the colonies. Margaret Brent arrived in Maryland in 1638 with her sister and nine colonists, the earliest group of settlers on record to have been led by women. Both Brent and her sister settled large plantations and then sent back to England for more workers. Brent was a successful farmer who added to her land holdings and built a fortune for herself. She was noted for her experimentation with seed production. She was also the first female attorney in Maryland, and a dynamic speaker who was credited with saving the colony from ruin when she talked a group of soldiers out of mutiny for nonpayment for their services.⁵⁵

Other colonies also offered land to women who paid their own way. For example, Pennsylvania offered seventy-five acres to women who came at their own expense. If they brought servants and children, their grants were so much larger. Salem briefly offered "maids lots" to women without husbands.⁵⁶ The records of the Quarterly Court in seventeenth century Essex County "give numerous glimpses of women about Salem who were wresting a livelihood from the land."⁵⁷ Kessler-Harris also notes that

Before 1699, South Carolina agreed to give pieces of land to men or women servants who completed their indentures. Virginia undertook to

import children over twelve who would serve as apprentices, after which the colony agreed to settle them on "the public land with best condition where they shall have houses with stock of corn and cattle to begin with and afterwards the moiety of all increase and profit whatsoever."⁵⁸

As a result, many women of the time became successful farmers. Some, like New Amsterdam widow Margaret Hardenbrook Philipse, developed their holdings into commercial fortunes.⁵⁹ But apparently the colonial governments began to think that independent women who could support themselves outside of marriage or domestic service were a threat to the social order, and began taking steps to limit women's economic opportunities. According to Kessler-Harris,

As early as 1634, Maryland began to reconsider its generous policy. A bill introduced into the House of Delegates that year threatened to remove land from spinsters. "Unless she marry within seven years after land shall fall to hir," wrote an opponent summarizing its provisions, "she must either dispose away of hir land, or else she shall forfeite it to the next of kinne, and if she have but one Mannor, whereas she canne not alienate it, it is ginne, unlesse she get a husband." Fortunately for women like Margaret Brent the bill was vetoed by Lord Baltimore, the proprietor. Massachusetts Governor Endicott refused land to Deborah Homes, "being a maid," he wanted to avoid "all presedents and evill events of graunting lots unto single maidens not disposed of." Holmes got a bushel of Indian corn instead. Georgia, settled a hundred years later, not only refused to grant women land, but denied them even the right to inherit it. This harsh policy, justified by the belief that estates required men who could defend them, was modified when fathers discovered that they could not bequeath land even to daughters who were their only children.⁶⁰

In most colonies, married women lost their property upon marriage, when it was transferred to their husbands. Even if the husband disappeared, the wife had no legal right to control the property.

Maryland required a special act of the colonial assembly before Susannah Tracy, whose husband had deserted her and her child, could sell a tract of land in 1709. But a Virginia woman of 1752 was not so lucky. When the Virginia House of Burgesses passed a similar bill to enable her to sell off a piece of land, the Board of Trade in England disallowed it, fearing that it would create a bad precedent.⁶¹

Most women acquired land by inheriting it from their husband after his death. Most colonies allowed a widow to inherit one-third of her husband's property until she remarried, but there were considerable variations from colony to colony. In Massachusetts, property went directly to the children, with instructions to give their mother a room to live in. In Maryland, on the other hand, a widow inherited all of her

husband's property for the rest of her life. Wives and daughters sometimes conducted business as the representative of their husband or father, but that practice became less common "as colonial policy discouraged women not only from land ownership, but even from representing their husbands in legal matters."⁶²

The Southern colonies, free of the Puritan influence that dominated in the North, appear to have offered white women more opportunities to take on a variety of roles. Women living on the frontier in the South spent less time spinning and sewing clothing than her counterpart in New England, but due to the longer growing season, she was more likely to work more in the garden. Kessler-Harris notes that "the southern frontier family tended to be more isolated than the community-oriented New England family. Circumstances required strength and self-reliance: women frequently handled rifles, hunted, trapped, and defended themselves against predatory creatures. It was all part of the job."⁶³

Wealthy Southern women often took on responsibility for managing not only the household, but the farm as well. In the seventeenth century, Elizabeth Yates of Virginia and Mary Trantis of Maryland became known for their experiments with crops and farm management.⁶⁴ The plantation wife ran the household and supervised servants, as did her New England counterpart, but she also "was called upon to make decisions about the planting and harvesting of crops as well as about their storage and sale. In her husband's absence, and sometimes in his presence, she took over the barter and exchange of crops for household supplies, earning a well-deserved reputation as an astute tradeswoman."⁶⁵

During the Revolutionary War, as in virtually every war that followed, women were forced to take on roles they might have otherwise left to their men. The National Life Insurance Company in Montpelier, Vermont, displays a mural of Mrs. Richard Wallace, a Thetford, Vermont, frontierswoman who "took her husband's place on the farm to work it singlehandedly, as did so many women whose husbands served with regiments during the American Revolution."⁶⁶

One invention of the late eighteenth century that had a major impact on the economy of the Southern states was the cotton gin. Patented by Eli Whitney, there has been considerable speculation for over 150 years about the contribution made by Catherine Littlefield Greene, in whose home Whitney was employed when the cotton gin was developed. Anne Macdonald, in her thoroughly-researched book *Feminine Ingenuity*, states

Everyone agrees that Greene (widow of one of General Washington's high-ranking military adjutants) and her manager (and later, husband), Phineas Miller, urged Eli Whitney, the newly hired, Yale educated, skilled mechanic at her Mulberry Grove plantation, to try to perfect what all planters wanted, a machine to separate seed from cotton. Whitney built a model, but progress ground to a halt when the cotton clogged the wooden teeth instead of slipping between them and passing through the slate of rollers. There is disagreement about events that followed. Some say that Kitty Greene surveyed the problem and asked, "Why don't you use wire instead of wooden teeth?" He did. It worked. Others contend that even if Greene

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did suggest wire (and few concede that much) her suggestion was not really "inventing" and no claim should be made that it was.⁶⁷

Macdonald comments further on the controversy concerning Greene's contribution:

Still, stories of Greene's ingenuity persisted, the first written mention that I have located being almost four decades after the Whitney patent: an 1832 letter from George Scarborough of Georgia to the magazine *Southern Agriculturalist*. Scarborough claimed that he had it on good authority ("derived from a much esteemed and lamented friend, who was the family physician and intimate friend of Mr. Phineas Miller") that when the cotton clogged the wooden teeth of Whitney's model, Greene remarked laughingly, "What! Allow such a trifle as that to worry you? Trust to a woman's wit to find the cure," seized the wire hearth-brush, and suggested to Whitney that he use it to comb through the cotton. Whitney gallantly replied, "Thank you for the hint. I think I have it now," and repaired to his workshop where he eventually developed the machine he patented – the one with wire teeth. According to Scarborough's source, no one could have been more surprised at this achievement than Greene herself, for she had been "perfectly unconscious" that her advice to use the broom could possibly inspire a breakthrough when she meant it only as a playful comment to relieve Whitney's chagrin over his inventive stalemate. All this, of course, was the opinion of the "intimate" source, and the rest is history. Eli Whitney's history.

A month after Scarborough's story appeared, however, an anonymous "subscriber" wrote *Southern Agriculturalist* to pass on what he had heard, although admittedly from sources he couldn't vouch for: When Phineas Miller handed Whitney the pod of green seed cotton and asked him, in Mrs. Greene's presence, whether he could invent a machine to separate the cotton from the seed, Whitney examined it carefully and then asked Mrs. Greene for a *pin* – which he used to pick off the cotton. Then, related the subscriber:

At this moment [with pin in hand], the idea flashed across his mind, that a machine composed of instruments with sharp points, which in the course of rapid revolutions, should tear off the cotton from the seed, would accomplish the object in view. He retired to his room with the idea in his mind, and never abandoned it until, by successive improvements, he brought the cotton gin to ... perfection.

"Subscriber" felt the incident proved that even a small hint can stimulate the mind of a genius to produce the "most magnificent results" and waxed eloquent over how "the widow's mite of experience" offered by the humbled individual might lay the foundation of "great and lasting benefits to mankind." So there was one early "maybe" vote for Greene.⁶⁸

As Macdonald notes, the story was perfect for late nineteenth century feminists who wanted to promote the cause of women's talents for invention, and protest the discriminatory treatment women had endured over the centuries. Matilda Joslyn Gage believed that Greene was the true inventor of the cotton gin, and wrote about the issue several times. Other feminists involved in promoting women's industrial efforts also took up the cause. Macdonald commented that "It's important to note that the flurry over Greene's contribution to the invention of the cotton gin occurred *decades* after Whitney's patent, but since the canon that mechanics was 'unwomanly' *still* prevailed, feminists like to point out that womanliness never won any prizes in the business world."⁶⁹

Sybilla Righton Masters

First American Woman to Receive a Patent
Colonial United States
1715

Sybilla Righton, a Quaker raised in the colony of West New Jersey, moved to Philadelphia in the 1690s when she married Thomas Masters, a wealthy merchant and landowner. Thomas later became mayor of Philadelphia in 1708, and provincial councilor from 1720-23.

In 1712, Sybilla traveled to England to apply for a patent for her invention of a process for refining Tuscarora rice, or maize. She had to apply in England because the American colonies of the time had no patent system. The patent was granted to her husband Thomas on November 25, 1715, but clearly credits her as the inventor.⁷⁰ Differing from other mills of the period because it stamped, rather than ground, the corn, the mill she designed consisted of cogwheels, mortars, and drying trays powered by horse or water. Thomas bought a mill in Philadelphia specifically to produce Tuscarora rice by Sybilla's patented process. Unfortunately, Tuscarora rice – which we know as cornmeal – was not well-accepted by the British, and the mill was a commercial failure.⁷¹

Eliza Lucas Pinckney

Farmer, Developed First Indigo Crop
Colonial United States
1722 - 1793

Indigo was the one of the most important export crops grown in the American colonies before the Revolution. "As a dye, it was in great demand among British cloth manufacturers, and its production was an important breakthrough for the colonies ... because producing the valuable blue dye improved their balance of payments with Britain and freed them from trade with the French, who were at war with Britain at the time."⁷²

It was Eliza Lucas Pinckney who developed indigo as a commercially viable crop in the southern colonies.

Eliza Lucas was born in the West Indies, the daughter of a British military officer who also owned three plantations in South Carolina. Her father encouraged her education and sent her to school in England. In 1739, when Eliza was 17, her father returned to his military post in the Caribbean, and left her in charge his plantations. She was responsible for "her family, its business, and the well-being of twenty slaves and an assortment of employees."⁷³ She worked hard and began experimenting with new crops, including ginger, figs, cotton, and alfalfa. By the time she was 21, Eliza Lucas was a wealthy, established planter. She married Charles Pinckney, an attorney from Charleston, and they had two sons who became Revolutionary War heroes.

The cultivation of indigo in South Carolina had been attempted some 70 years before Eliza Pinckney had a go at it, but had failed. The plant was very sensitive to soil and weather conditions, and although it flourished in the Caribbean, where the French had a monopoly on the industry, conditions were apparently not so favorable in the Carolinas. Nevertheless, Pinckney decided to try it again.

She was able to grow the crop successfully, but ran into difficulties with the manufacture of dye cakes from the raw plant. She imported a technician from the Caribbean to work on the problem, but he sabotaged the product out of fear that her success would mean economic disaster to his island's economy. When Pinckney found out, she fired him, and eventually hired his brother, who was more reliable. "By 1744 Eliza was able to export seventeen pounds of indigo dye to Britain, and she gave away the bulk of her crop to other Carolina growers so that indigo could be seeded throughout the area.... By 1747, South Carolina exported 135,000 pounds of indigo dye."⁷⁴

The industry – and South Carolina's economy – thrived for over 30 years. Exports were as high as a million pounds a year in 1859. The industry slumped, however, during the Revolutionary War when England began importing indigo from India, which was a more cooperative colony at the time.

When Pinckney died in 1793, George Washington was a pallbearer at her funeral. Her creativity and vision were instrumental in developing a stable economy for the Carolina colonies before the Revolution.

Canada

In Quebec to the North, the main economic activity was fur trading, while farming "was a more or less secondary activity in the colony" during the entire period of French rule.⁷⁵ According to Gerald Fortin, "in this context the wife played a more important role than the peasant woman in France at that time. Left by herself for many months at a time she had to take charge of the farm, if there happened to be a farm, and of the entire family."⁷⁶

Fortin notes that under French rule, less than a quarter of the immigrants from France were peasants, the majority being soldiers or merchants. With a lack of agricultural experience, the farming techniques practiced in Quebec from 1760 until after World War II were a form of subsistence farming not far removed from gathering techniques.

Often the wives were better educated than their husbands, so they managed the books and financial affairs of the family farm, and influenced decisions about the farm operation.... If subsistence farming started and continues to exist in Quebec it is mainly because the rural wife believed in this way of life and succeeding in imposing it on her husband and sons. This is all the more true since the wife actually had to take charge of the farm work for three or four months a year because her husband had to go away and work in the forest.⁷⁷

Farming techniques began to change when the farm wife changed her "image of the situation,"⁷⁸ which began to occur between 1940 and 1950. The demands of World War II brought great prosperity to agricultural Quebec, despite the low technology of the farming techniques. Farm families experienced higher standards of living made possible by access to more consumer goods. The farm wives discovered a "new type of economic calculation, which takes both cost and time spent into account,"⁷⁹ and began to switch from their traditional labor-intensive work to more profitable activities, such as raising poultry and hogs. The second factor in farm women's new approach to farming was brought on by the introduction of the radio, which reduced the philosophical and ideological isolation of rural farming communities, by bringing urban ideas and culture into people's homes. Women and children, listening to the radio, became the central figures in the changing values of rural Quebec farm life.

African-Americans

As one nineteenth century white abolitionist observed with bitter irony, the slave master made "a noble admission of female equality"⁸⁰ in his work assignments. Any notions about female delicacy went out the window when it came to grading slaves according to strength and endurance. Most female slaves were rated at about three-quarter hands when compared with a healthy male "hand." But as Jacqueline Jones notes, "there were enough women like Susan Mabry of Virginia, who could pick 400 or 500 pounds of cotton a day (150 to 200 pounds was considered respectable for an average worker), to remove from a master's mind all doubts about the ability of a strong, healthy woman field worker."⁸¹ Before 1660, the colonies of Virginia and Maryland "explicitly acknowledged the use of black women in their fields by taxing them in just the same way as they taxed male field hands."⁸²

African-American slave women not only worked in the household arena; they worked in the fields and in most other areas that demanded considerable physical strength.

Work assignments varied according to the plantation or farm's size and degree of specialization. Generally, "the smaller the farm, the more arduous and varied was women's field work."⁸³ In the cotton-growing areas, African-American women worked alongside men for up to 14 hours per day, plowing, dropping seed, hoeing, picking, ginning, sorting, and moting cotton. "In the fields the notion of a distinctive 'women's work' vanished as slaveholders recognized that 'women can do plowing very well & full well with the hoes and [are] equal to men at picking.'"⁸⁴

In Virginia, North Carolina, Kentucky and Tennessee, women hoed tobacco; laid worm fences; and threshed, raked, and bound wheat. For those on the Sea Islands and in coastal areas, rice culture included raking and burning the stubble from the previous year's crop; ditching; sowing seed; plowing; listing and hoeing fields; and harvesting, stacking, and threshing the rice. In the bayou region of Louisiana, women planted sugar cane cuttings, plowed, and helped to harvest and gin the cane. During the winter, they performed a myriad of tasks necessary on nineteenth century farms: repairing roads, pitching hay, burning brush, and setting up post and fence rails.⁸⁵

Following the Civil War, many African-American women, especially those in poor tenant families, continued to work in the sugar, tobacco, and cotton fields. In fact, agriculture was the industry in which most African-American women found employment in the latter half of the nineteenth century, nearly 39 percent in 1890. Domestic service came in second, at nearly 31 percent.⁸⁶ According to Wertheimer, African-American women prisoners were dressed in men's clothing and put to work in the fields alongside men prisoners.⁸⁷

A Miss Montgomery, the daughter of a former slave, wrote a letter to Frances Ellen Watkins Harper, an African-American feminist writer and lecturer, in which she described the life and work of women in her Mississippi community. The letter was published in the *Englishwomen's Review* in 1878. Miss Montgomery wrote:

There are many women around me who would serve as models of executiveness anywhere. They do double duty, a man's share in the field, and a woman's part at home. They do any kind of field work, even ploughing, and at home the cooking, washing, milking and gardening. But these women have husbands; let me tell you of some widows and unaided women:

Mrs. Jean Hill, a widow, has rented, cultivated, and solely managed a farm of seven acres for five years. She makes her garden, raises poultry, and cultivates enough corn and cotton to live comfortably and keep a surplus in the bank.

Mrs. Jane Brown and Mrs. Halsey formed a partnership about ten years ago, leased nine acres and a horse, and have cultivated the land all that time, just the same as men would have done. They have saved considerable money from year to year and are living independently. They

have never had any expenses for labor, making and gathering the crops themselves.

Mrs. Henry, by farming and peddling cakes has the last seven years laid up seven hundred dollars. She is an invalid, and unable to work at times. Since then she has been engaged in planting sweet potatoes and raising poultry and hogs.⁸⁸

The years following the Civil War saw many people move to the western frontier, searching for independence and a better life for themselves and their families. African-Americans were no different, and many former slaves made their way west.

Life on the frontier was unsettled, partly due to the numbers of single males. Married black women decided to improve conditions by recruiting single women to come west as mail-order brides. The new brides often found life hard. They "had to labor dawn to dusk in field and home, and work at making their marriage successful with a man not of their own choosing. Often they had to rear children from previous marriages as well as their own."⁸⁹ Nonetheless,

Some women, born or married into rural families, grew to love frontier life.... Marguerite Gomez, 16, married Brighton, Colorado, farmer James Thomas, 32, father of seven children. After shaking off initial disasters, she learned to herd and break horses, and to pour medicine down the throats of ill animals. Doris Collins of Rock Springs taught herself to become a better rider (even bareback) than her two brothers, despite her mother's furious disapproval.⁹⁰

Mexican-Americans

An intriguing glimpse into the lives of women under Mexican rule is offered by a document from Santa Fe, dated January 1712. "It reflects orders apparently initiated in Mexico that tools should be distributed to inhabitants of Santa Cruz for their aid; apparently Santa Cruz was experiencing some economic difficulty."⁹¹ The document lists 56 individuals who received four types of tools, all agricultural: digging sticks, axes or hatchets, hoes, and plow shares (the small iron section of the plow that actually creates the furrows). Of these 56 individuals, 23 were women, nearly half of whom were widows. As Angelina Veyna comments, "It is interesting to note that only women... were recipients of plow shares."⁹² Unfortunately, neither the document nor Veyna can shed light on why the plow shares were assigned solely to women.

Under Spanish law, married women were able to own property in their own name. One historian who studied land-grant activity discovered "that a number of Spanish-Mexican women in provincial California played an important part in the acquisition of land grants.... Of the sixty-six women associated in one way or another with provincial land grants, twenty-two were successful in eventually obtaining a United States patent after the American conquest."⁹³ These women can be seen as exceptional because they were able

to obtain the grant through American tribunals, and since numerous mechanisms – legal and non-legal – were used to defraud Chicanos of their land after the American takeover, these women managed to resist the land grab as well.

One such woman was Juana Briones de Mirande, who was born in 1796 in Monterey or Carmel. Estranged from her husband, she petitioned the bishop for permission to live apart from him, and she successfully obtained a land grant in what is now part of San Francisco. There she built an adobe home, which is still in use, cultivated fields, and raised livestock. Known as the Widow Briones, she "gained prominence for her philanthropic activity and for being the only female householder in Yerba Buena."⁹⁴ She lived on her land until late in her life, and died in 1889.

Sandra Myres, in *Westering Women and the Frontier Experience*, noted that

A surprising number of Western women, both single and married, took up land in their own name. In the former Mexican states and territories, where Spanish rather than English law prevailed, married women could hold separate property in their own name, and many took advantage of the opportunity to purchase and administer their own land. Indeed, Jane McManus Storms Cazneau applied for, and received, an *empresario* grant from the Mexican government. During the Texas Revolution she offered to borrow money against her land holdings. "As a female, I cannot bear arms for my adopted country," she wrote in 1835, "but if the interest I possess in her soil will be a guarantee for any money, I will with joy contribute my mite to purchase arms for her brave defenders." In other former Mexican states, other women, both of Mexican and English ancestry, owned farm and ranch property which they administered themselves.⁹⁵

United States, Nineteenth Century

Harriet Martineau, touring the Midwest in 1834-35, reported that women normally did not work in the fields, and that "the general custom frowned upon women performing heavy work (except Negro slaves in the South)."⁹⁶ The *Prairie Farmer* shared that opinion, writing in 1851 that only German women worked in the fields. But as always, notions of female delicacy fell by the wayside in times of great need. One writer reported that the harvest in central Michigan was so great in 1839 there was not enough help to be found anywhere: "At this moment, every man and boy, and even women are actively engaged in cradling, raking, binding and shocking the golden harvest."⁹⁷

Nonetheless, a few women were engaged in agriculture. Elizabeth Anthony Dexter, in *Career Women of America: 1776-1840*, quoted Carolyn Dall, a writer of the mid-nineteenth century:

In Ohio, last year, about thirty girls went from farm to farm, hoeing, ploughing, and the lot for 62½ cents a day. At Media, Pennsylvania, two

girls named Miller carry on a farm of 300 acres, raising hay and grain, hiring labor, but working mostly by themselves. These women are not ignorant; they at one time made meteorological observations for an association auxiliary to the Smithsonian Institute. But labor attracts them, as it would many women if they were not oppressed by public opinion.⁹⁸

The Civil War forced many women, particularly wives of tenant farmers in the rural South, to work the farms while the men were at war.⁹⁹

The second half of the nineteenth century saw a groundswell of American inventiveness. As manufacturing became more industrialized, businesses began actively seeking new products to manufacture. The field of agricultural equipment was no exception. As women became more directly involved in agriculture due to the Civil War and the Homestead Movement, they saw the need for new or better implement designs. Many women invented and patented agricultural equipment.

Nineteenth-century feminist writer Matilda Joslyn Gage, in her essay "Woman as Inventor," credited Ann Harned Manning of Plainfield, New Jersey with a "great American invention," the mower and reaper. In 1817-18, Manning perfected a system for the combined action of teeth and cutters, which was patented by her husband. According to Gage, "Mrs. Manning also invented a clover cleaner, which proved very lucrative to her husband, who took out the patent."¹⁰⁰ In 1861, Elizabeth Smith, also of New Jersey, patented an improvement to the mower and reaper, which made it possible to adjust the blades while the machine was in operation.¹⁰¹

Anna E. Baldwin was involved in dairy farming, and patented several inventions to maximize efficiency in that industry. Her patents include an "improved process of treating milk to obtain useful products" (1868), and improvements in milk-separators (1868), milk-coolers (1869), and cow-milkers (1879).¹⁰²

Anna Trexler patented a combined plow and harness in 1888, and Lucy Easton patented a machine for separating flaxseed in 1890.¹⁰³ Other agricultural implements patented by women included a corn plow and an improved corn husker.

During the last three decades of the nineteenth century, agriculture was consistently among the top ten industries employing women. In 1870, agricultural labor was the second largest occupation of women, with only domestic labor employing more. Farmer and planter came in ninth. Agricultural labor employed over half of all workers, male and female, in the United States during the 1870s. The numbers of people employed in agriculture rose in the following decades, but not at the same rate as the rest of the population. So while the overall numbers rose, the percentage of agricultural workers out of the whole declined, reflecting the national shift from rural life to urban living and industrialized employment. Nonetheless, in 1890, agricultural labor was still the second largest occupation for women. Interestingly, farmers, planters, and overseers rose to fifth place.¹⁰⁴ A Women's Bureau survey of women's employment trends reported that "Women classified as farm owners and tenants or as farm managers and foremen rose in number from less than 25,000 in 1870 to over 300,000 in 1900, increasing in each decade at rates considerably above the rate of population growth. After 1900 the numbers of women in the farm operator group dropped, showing a particularly large decrease from 1930 to 1940."¹⁰⁵ One explanation for this dramatic, albeit temporary, increase in the

numbers of women farm operators was undoubtedly the large numbers of single women who proved up homesteads in the period.¹⁰⁶

Homesteaders and Ranchers

The social upheaval brought about by the Civil War continued afterward as families moved west to seek their fortunes, lured by the promise of free land. Many who answered the call were women. "From 1862 to 1934, under the auspices of the Homestead Act and related legislation, thousands of widows and single women proved up homestead claims. Women made up a significant proportion of those who took out claims – in some areas, close to 20 percent."¹⁰⁷ One observer estimated that by 1886 one-third of the land in the Dakotas was held by women.¹⁰⁸

Some women took out claims to add to the holdings of a father or brother. Others saw their claims as an investment: Anna and Ethel Erickson in North Dakota used their land to raise money for college.¹⁰⁹ And like some male homesteaders, some women found that the work of proving up the claim was harder than anticipated and gave up after a year or two.

But many persevered. Sometimes sisters or friends, or a sister and brother, took out adjoining claims and helped each other with the labor of developing the land. The four Chrisman sisters, Hattie, Lizzie, Lutie, and Ruth, each took out a claim in Custer County, Nebraska. They took turns living with each other and sharing the labor.¹¹⁰

Two friends, Bee Randolph and Mary Anderson, took out adjoining claims in Colorado in 1886 and built a shack over the property line. When Mary married the next year, Bee wrote in Mary's autograph album:

Dear Mame – Here we are in our little preemption home for the last time together, at least for some year [sic] to come. But I hope sometime we may visit again. We cannot be happier than we have been here, although we may have wealth and other great pleasures. Can you not almost remember every happy day from the first, what has happened? Our laughing, singing, playing, working, our company, etc.¹¹¹

Some women joined into larger ventures.

An enterprising group of Oklahoma women formed an all female "sooner company," raised \$2500 to use in developing their claims, and successfully entered the Cheyenne and Arapaho Reservation ahead of the scheduled land run. Another legal company of twenty-two women established claim to 480 acres of land in the Cherokee Strip when it was opened in 1893, and by 1894, "they were the proud owners of three teams, two cows, chickens, and other stock."¹¹²

Kathryn Harris commented on the motivations of the women who took out their own homestead claims:

For these young women, one of the essential attractions of homesteading was the independence that proving up a claim offered. Self-determination was not an option generally available to their sex. Yet homesteading held out that possibility, sanctioned by laws whose original intent was to encourage settlement by families and, thereby, social and political stability on the agricultural frontier. Moreover, the legal right of single women to patent government land had an unforeseen result. The elevated status and autonomy of this very visible group in the local female population served as an inspiration to all women and especially to girls, who were most receptive to novel ways of acting. To be sure, the labor shortage and the relative isolation of the family unit, which forced its members to greater reliance on each other, also played a part in promoting mutuality between the sexes. But the possibility of acquiring land raised the expectations of all females in the homesteading community. "Why can't I have some [government land], too?" was a question that surely more than one spinster asked herself. And while wives could not enter claims, they probably acquired some psychological benefit from the unprecedented opportunities for land ownership available to their daughters and others of their sex. It is true that for some women, the climate of enhanced freedom of action and elevated economic status was not worth the disruption of well-defined sex roles and the physical hardships pioneering imposes. But for those of a more resilient disposition, homesteading... had much to offer.¹¹³

A woman homesteader who typifies Harris' analysis was Elinor Pruitt Stewart, known to history through the publication of her letters. Stewart was a successful and enthusiastic homesteader who believed that homesteading offered women the opportunity for independence. She wrote,

To me, homesteading is the solution of all poverty's problems.... Any woman who can stand her own company, can see the beauty of the sunset, loves growing things, and is willing to put in as much time at careful labor as she does over the washtub, will certainly succeed; will have independence, plenty to eat all the time, and a home of her own in the end.¹¹⁴

In one letter, Stewart gave an accounting of her farming success.

We had all the vegetables we could possibly use, and now Jerrine [my six-year-old daughter] and I have put in our cellar full, and this is what we have: one large bin of potatoes (more than two tons), half a ton of carrots, a large bin of beets, one of turnips, one of onions, one of parsnips, and on the other side of the cellar we have more than one hundred heads of

cabbage.... I milked ten cows twice a day all summer; have sold enough butter to pay for a year's supply of flour and gasoline. We use a gasoline lamp. I have raised enough chickens to completely renew my flock, and all we wanted to eat, and have some fryers to go into the winter with. I have enough turkeys for all our birthdays and holidays.

In all I have told about I have had no help but Jerrine. I have tried every kind of work this ranch affords, and I can do any of it. Of course, I *am* extra strong, but those who try know that strength and knowledge come with doing. I just love to experiment, to work, and to prove out things, so that ranch life and "roughing it" just suit me.¹¹⁵

Stewart's soulmate north of the border was Georgina Binnie-Clark, who was born in England and moved to Saskatchewan in the early years of the twentieth century. With her sister, Binnie-Clark bought land and began farming wheat. The two sisters shared management of the farm, and had 275 acres in production by 1930.

In contrast to the United States, Canadian law did not permit women to file homestead claims in their own names. Binnie-Clark, feeling strongly that farming was an ideal occupation for women, made several trips to Ottawa to persuade the government to open homesteading to single women. Her efforts were unsuccessful. Despite Binnie-Clark's own success as a farmer, the agriculture minister told her that women were not suited to farming. Binnie-Clark decided to try a different approach.

Believing ... that "the only way of going on" lay in "refusing to give up," Binnie-Clark returned the following autumn to her farm near Fort Qu'Appelle. There she embarked on a remarkable teaching project in which prospective women farmers from England came to her to gain experience in prairie agriculture – and, as she remarked in her book [*Wheat and Woman*] to gain self-confidence as well. "Over and over again," she wrote, "I recognized the splendid qualities I had always believed to be in women, and I don't think a woman ever worked on my wheat-land without discovering a finer energy and a stronger and more independent Self than she dreamed she possessed...."

Believing that "marriage was accepted by many women as the sole resource against labor in a world governed by laws made by men for men, where there is but the scantest justice and scant wages for the labor of women," Georgina Binnie-Clark proposed a novel solution to the plight of the redundant [i.e., unmarried] woman: farming in Canada. The governing purpose of *Wheat and Woman* was to convince the English reader that "what men had done for themselves in agricultural pursuits on the prairie, women could also do for themselves. Woman can earn for herself independence and in time wealth."¹¹⁶

In addition to the numbers of women who staked their own claims, many more women lived and worked on claims staked by their husbands and fathers. What they soon learned was that just about any work was "women's work." The chronic shortage of labor

in frontier areas demanded that everyone do whatever needed to be done. As one woman recalled, "The thing you learn on a farm is that the cultivating of crops and the butchering is man's work, while everything, including cultivating the crops, is woman's work, except the butchering."¹¹⁷

To compound the shortage of labor, the men were sometimes called away from the homestead. In those cases, the women took over the running of the farm. Not all of them relished the job:

Lizzie Simons, whose husband joined the Texas forces during the Civil War, wrote out a long list of the "unladylike jobs" she had to perform. She had the horse and buggy to harness and unharness, she complained, and when she "undertook to take the calf down to the lot it almost jerked me to pieces." Moreover, she found she had to become a cooper and caulker to keep her tubs and barrels in order, and she also "put in window glass – swung a gate" and "put new fossit [sic] in cistern."¹¹⁸

Rural Mormon women in particular were often responsible for the running of their farms for as much as several years at a time while their men were gone on church missions. One Mormon wife, Mary Ann Hafen "somewhat bitterly recalled [that] it was difficult to oversee both home and farm chores and care for the children as well. Moreover, as another plural wife recalled, Mormon women who lived in the country received less monetary support from their husbands because they had 'free' produce and foodstuffs."¹¹⁹

In contrast to Lizzie Simons and Mary Ann Hafen, some women thrived on farm work. One such woman was Eva Morris, who ran the farm when her father was away. A family member commented that "farming and working with animals was her main love – housework was for girls, not for Eva."¹²⁰

Ranch women in the frontier period often attempted to maintain a "civilized" life, but many, like their farming counterparts, worked alongside their husbands. Alice Brown was one such woman. She "worked closely with her husband on their Big Bend ranch and was reputed to be an excellent shot and a daring and skilled rider."¹²¹ Even those who didn't actually work the ranch were forced to grow into new roles and ways of being. As Sandra Myres observed,

Whether ranchwomen confined themselves to more traditional roles or actively participated in ranch operations, they tended to become increasingly self-reliant and independent. According to Nannie Alderson [a frontier rancher's wife], "the new country offered greater personal liberty than an old and settled one," and although she admitted that her years of ranch life never taught her any business sense, she nonetheless believed that Western ranch life instilled a good deal of self-reliance in women and children. This opinion was shared by a number of outside observers. The English visitor Anthony Trollope wrote in 1862 that ranchwomen were "sharp as nails and just as hard." They were rarely obedient to their

menfolk, he reported, and "they know much more than they ought to. If Eve had been a ranchwoman, she would never have tempted Adam with an apple. She would have ordered him to make his [own] meal."¹²²

Obviously, Trollope preferred women a bit more submissive, but there was no getting around the fact that ranchwomen had to be strong and competent, and most rose to the occasion.

Many women discovered that they were well-suited to ranch life, and took pride in their skills. These women often

boasted of their prowess in driving teams, planning and constructing improvements to their homes and farms, and fighting prairie fires, grasshoppers, and the elements. "I was said to be a good driver of horses," said one woman. "At any rate, when in my buckboard my husband who was on horseback, unless I wanted him to, could not pass me." Bragged another, "The men folks never doubted my ability to do most anything."¹²³

One woman told an interviewer that she found "real pleasure" in ranch work. "I love to work with cattle, and have spent a good deal of my time on the range in Southern Arizona."¹²⁴ A ranch widow in Texas "wrote with pride that she was able to provide a 'safe and secure' living for herself and her two children in the ranching business and had begun to 'feel more confidence in myself now and reconciled to living alone.' "¹²⁵ Carrie Dunn recalled that her mother "was a neat and efficient housewife, but repairing fences, searching for livestock or hunting were always legitimate excuses to take her out."¹²⁶

Rancher Ann Bassett was one cattle woman who did everything on her ranch. An observer said that Bassett "could fit right in the toughest cow camp... take her place in the saddle with the rest and live the life they lived, doing with equal skill her share of the work on the range."¹²⁷

Some women, such as Dakota rancher Grace Fairchild, were better managers than their husbands and took over the business, or ran businesses of their own. Fairchild commented that her husband was "a man not fitted to be a pioneer," and she took over management of the business to prevent bankruptcy.¹²⁸

Lizzie John Williams was another shrewd cattlegwoman who did very well in the cattle business. She was already a successful businesswoman when she married Hezekiah Williams, and she kept her assets separate from his throughout their marriage. This turned out to be to Hezekiah's benefit, for he lacked Lizzie's business acumen and she bailed him out of several difficult financial situations. Between 1879 and 1889, Lizzie and Hezekiah each took their own herds up the Chisholm Trail to Kansas. It's said that Lizzie let Hezekiah ride in her buggy, but that was as much help as he got from her.

Some women found themselves forced to take over the ranch when their husband was not able, due to poor health, death, or taking another job to support the family. Mrs. William Mannix of Montana took over the family ranch in the early 1900s after her husband was crippled by polio, and they had ten children to feed. In addition to running the ranch with minimal hired help, she supplemented the family income by driving a passenger and mail stage route twice a week for fifteen years. Drought forced her to sell

the ranch just before the Depression hit, but she immediately started working to buy it back. It took her twenty years, but she succeeded. "When Mrs. Mannix reached seventy years of age, her sons decided that she ought to retire. She did not agree. She took to riding off at dawn and did not return until late at night. Finally, deciding that when mother rode the range they at least knew where she was, the boys invited her out of retirement."¹²⁹

Rose Katherine Hilton got a late start to ranching: she was fifty-eight and on her own when she first got into a saddle. She raised cattle on her New Mexico ranch, kept rabbits and chickens and saddle ponies, and was carrying mail to seventeen mountain families when she was seventy-one.¹³⁰

Idella Smyers ran the family ranch in Texas when her husband ran a freight wagon. "She roped, branded, bulldogged, charmed horses, dosed sick cows, and tailed up weak ones. She ran the ranch and made business deals, and she used a brand of language that her neighbors understood. Idella was a ranch woman in the best sense of the word, and so far as is known, nobody ever said whether she was a good cook or not."¹³¹

When Cornelia Wadsworth Adair began visiting the JA ranch in Texas, she "usually brought a trainload of personal baggage, dozens of maids and butlers, and all the luxuries of the East."¹³² The wife of wealthy Irishman John G. Adair, she was as unlikely a ranch woman as any, and more unlikely than most. Her husband had financed the JA, a million-acre ranch venture in the Texas panhandle. After John's death, however, "Mrs. Adair surprised some of her critics by becoming one of the best ranch managers in Texas."¹³³

Helen J. Stewart of Nevada was another woman who earned a considerable reputation as a ranch manager and businesswoman. After her husband's death, she took over his extensive mining and ranching properties.¹³⁴

Some women got started on their own, and supported themselves well with their ranches. For example, Hannah Manassee, a divorced Jewish woman in California, supported herself and her daughter by raising cattle.¹³⁵ Starting out in a tent with a seven-year-old daughter to support, Mary Ahart of Laramie, Wyoming, started her ranch with just two cows and two calves. She sold the milk, and invested her profits in another calf. "In less than seven years Mary possessed several hundred head of cattle, a farm, a comfortable, 'even luxurious' home and property valued at forty to fifty thousand dollars in 1875."¹³⁶

Still another woman who got started on her own was Fanny Seabride of Chicago, who took a position as a governess at the Horseshoe XX ranch in Texas. But she did not remain a governess for long:

Apparently Fanny got in some riding practice after hours, because when one of the cowboys got hurt, Fanny forked a mustang before anybody could stop her and went to finish the cowboy's job of mending fences. When the cowboy quit, Fanny applied to Colonel Sansome, owner of the Horseshoe XX, for his job. The Colonel obliged her and Fanny went to it, quirt and spur. According to a newspaper item, killing wild animals for bounty became Fanny's thing. She bagged "531 coyotes, forty-nine lobo wolves, thirty-nine wildcats, two bear cubs and a Mexican leopard." With

the accumulated bounty of \$1,261 Fanny proceeded to buy land and cattle and established her own ranch.¹³⁷

There were even a few women who put on men's clothes and passed as men in order to live the kind of life they chose. Katherine Vosbaugh passed as a man for sixty years. Born in France in about 1847, she was well educated. Apparently she took on a man's identity because to the greater opportunities for employment. When she came to the United States, she made her way west, working in a variety of men's jobs, such as bank clerk, restaurateur, cook, and sheep herder. Known as "Frenchy," she ran the most popular restaurant in the Southwest for a time, and eventually made her way to a Colorado sheep farm, where "for years she lived with men on the ranch, cooking for them, assisting them in the ranch work and sleeping in the same rooms."¹³⁸ Her secret was not discovered until she was stricken with pneumonia. Her health failed after that, and she died two years later, in 1907.

Jo Monaghan, an Idaho cowboy in the late nineteenth century, lived most of her life as a man. According to Joyce Roach,

Jo was one of those wronged women who decided that since her life was ruined anyway, she might as well go west. She left her small son in the care of her sister and tried mining and sheep herding before she began trailing cows. Jo had problems from the beginning. When you are barely five feet tall in a pair of high-heeled boots, when you shun saloons and will not spend money on dance halls or gambling or liquor, and when your appearance is delicate and your voice high-pitched, folks notice. The fact that Jo was a superb horseman and bronc buster, a dependable drover, and an expert with a lariat was not peculiar. Nevertheless, Jo kept to herself, raised cattle, horses and chickens on a ranch and generally lived the life of a recluse.¹³⁹

Jo's true identity was discovered after her death, and gave her neighbors something talk about for quite some time.

Another passing woman who achieved enough renown that several women claimed to be her, was Mountain Charley. For thirteen years after her husband died, she supported her daughter by working as a gold prospector in the Rockies, running a freight business, and herding cattle to California. She remarried in 1860 and resumed her female identity.¹⁴⁰

Ranch daughters were even more likely than their mothers to learn to ride horses and herd cattle. Annette Taylor, who had kept books for her father's ranch, took over the management after his death. At the time, the ranch was nearly bankrupt. Annette not only got the operation back on its feet, she had paid off the mortgage in just a few years. She did more on the ranch than just the books:

She rode the range, held her herd together, and hired as few men as possible. She sometimes spent as much as thirty hours at a stretch in the saddle.... Annette's sister Alice often rode the range with her. They dressed

like men, slept in tents many miles from home, and went armed during roundup.¹⁴¹

Annette also studied books on cattle diseases and learned to treat her herd. She experimented with new grasses, and introduced an Australian variety that grew especially well in Arizona's arid climate.

Other daughters worked hard on the ranch, as well. The daughters in the Nelson family in Colorado drove the family's cattle to the winter feedlot, twenty-five miles each way.¹⁴² A much-reproduced photo shows three women in long skirts, branding cattle. They were the daughters of Fritz Becker, and along with their brother, they ran the family's big ranch in 1894.¹⁴³

Perhaps the most famous ranch daughter of the late-1900s was Agnes Morley Cleveland, who wrote a book called *No Life for a Lady* about her experiences growing up on a remote New Mexico cattle ranch. The idea for the ranch had been her stepfather's, and her mother, a genteel and educated woman from the East, went along with it. Shortly after their new house was built, however, the stepfather deserted them, leaving Agnes' mother, who never developed much business acumen, to struggle for survival. "Agnes and her brother Ray, though still in their sub-teens, took hold where their mother could not. They became expert riders, learned the stock, worked at herding, and even succeeded in retrieving some of their cattle from rustlers by the simple method of stealing them back."¹⁴⁴ A scout from Buffalo Bill's show saw Agnes control a difficult horse, and offered her a place in the troupe. She declined, however: "Agnes had no desire to ride broncos for money; her pride lay in the fact she could keep a horse *from* bucking."¹⁴⁵

There was no lack of adventure on the ranch. One night Agnes kept some unsavory characters occupied until morning by playing poker – and winning; the next day she learned they were outlaws on the run. She carried a gun, which she never had to use. "A six-shooter does give one a sense of security," Agnes reflected. "We had a saying, 'a six-shooter makes all men equal.' I amended it to 'six-shooter makes men and women equal.'"¹⁴⁶

On one occasion, and despite assurances to the contrary, the sheriff's deputy took her favorite horse, Gray Dick, for a bankruptcy auction.

Agnes set out to get her horse back. "Subsequent happenings," she said, "made local history." She pursued the deputy sheriff and overtook him as he stood talking with a group of cowhands who were helping him move the ranch's stock. When the deputy refused to return her horse, Agnes galloped toward Gray Dick, plunging right through the herd of horses and scattering them in every direction. Her reins got away from her, her horse tripped, she flew into the air and came down in a somersault. Instantly she was on her feet and unhobbling Gray Dick.

When the deputy tried to interfere, Agnes picked up a strap weighted with a heavy bell, and warned him off. "One step closer and I'll brain you with this bell." The deputy backed away and Agnes got her horse.

Later a cowhand told her that several of the men had watched the proceedings with their hands on their guns, "waitin' to see if you missed your shot with that bell, but o'course we didn't want to spoil your play."¹⁴⁷

Agnes loved the life and would have preferred to stay on the ranch for her adolescent years. Her mother, however, believed in the importance of a good education and, despite constant financial difficulties, managed to send her children to boarding schools in the East. When a college sorority sister accompanied Agnes home on a vacation, the other sorority sisters had taken her aside and said,

"Grace, we want you to take careful note while you are visiting Agnes. You know, Agnes worries us. She seems to be a truthful enough person generally, but we just can't believe all the things she tells us about that New Mexico cattle ranch. Just keep your eyes open and report.

Three weeks on the ranch – and Grace wrote the sisterhood, "I want to report that Agnes' stories indicate admirable self-restraint on her part."¹⁴⁸

Some ranch daughters used their skills to make a living. Rancher Marie Bell of Wyoming recalled that when she was girl in the early 1900s, "Girls came through the country, riding from ranch to ranch, breaking horses. Usually they traveled alone and they had horses with them that they were taking home to break. Of course, in those days, everybody had fifty or sixty saddle horses.... They were very nice girls. It was just a case of making some money, and that's the only way they had."¹⁴⁹

Other ranch daughters turned their skills into careers in Wild West shows and rodeos, as will be discussed in a later section.

Twentieth Century

Employment trends in the United States during the first half of the twentieth century reveal a steady decrease in the significance of agricultural labor for women. In 1910 farm laborers were still the second largest group of women workers, with farmers having fallen to back to ninth place. By 1930, farm laborers (including unpaid family workers) had slipped to sixth place, below domestic servants, school teachers, stenographers and typists, other clerical workers, and saleswomen. By 1950, agricultural labor no longer placed in the top ten.¹⁵⁰ The Women's Bureau reported that

Among women in agriculture in 1940, 5 out of every 10 were unpaid family workers, 3 were farmers, and 2 were wage laborers. Available data show that the proportion of women farm workers who were farmers grew [although the actual numbers dropped] from 1910 to 1940, whereas the proportion working as farm laborers declined. Further details of 1930 and 1940 indicate that the drop has been entirely among the unpaid family

workers, and that the proportion of women doing farm labor as wage workers grew.¹⁵¹

The First World War was accompanied by an agricultural expansion. The government encouraged efforts to recruit women for agricultural work during this period. As a result, the proportion of women among the total of agricultural workers reported in 1920 was the largest on record.¹⁵² Following the war, however, the numbers of women in agriculture dropped precipitously. The Women's Bureau reported that despite the proportionate increase in women agricultural workers during the war period, there was an overall decrease in the numbers.

After 1910 the advance of power farming, the cityward movement of the rural populations, and the gradual increase in large farming operations at the expense of the small family-operated farm affected the numbers of farm workers, women as well as men. The numerical decline among women agricultural laborers became so great and so rapid that by 1940 there were fewer women farm laborers than there had been in 1870.¹⁵³

A significant proportion of the women working in agriculture, with the exception of the farm operators category, were women of color. Dorothy and Carl Schneider, in their overview of women's work experience, noted that

Like domestic service, agricultural work has been a means by which successively arrived ethnic groups in North America have become wage earners. The male European immigrants who came before the late 19th century could usually claim or buy land, but blacks and more recent arrivals more often have worked for wages or as tenant farmers or sharecroppers.

Women's participation in agricultural work has varied according to their racial-ethnic group. Generally, women of color have worked in the fields more than European Americans – though among Puerto Ricans, for example, women have not traditionally farmed.

In the twentieth century, mechanization has dramatically reduced the absolute numbers of agricultural workers and their proportions in the work force, from more than 10 million in 1900 to fewer than 3 million in 1980; or from one worker in three to one in 30. Though in 1900, 44.2 percent of black women workers, 47.2 percent of Native American women workers, and 58.1 percent of Japanese-American women workers labored in agriculture, by 1980 only Chicanos had as many as 2.9 percent of their women workers in this occupation. Yet of the relatively few farm workers in 1990, women constituted 21 percent.¹⁵⁴

Japanese-American women labored on Hawaiian sugar cane plantations, where, despite the stereotype of Japanese women as passive, "they participated along with other Asian workers in numerous strikes for better working and living conditions, better wages, and for union recognition."¹⁵⁵

Japanese immigrants on the west coast proved to be creative and determined farmers.

The first Japanese immigrants had been quick to buy raw stump land or bottom acreage that no one else cared to farm. For them, no crop was too difficult to nurture, and from Washington to California, they carefully tended potatoes, strawberries, cauliflower, and beans. Their farms, if small, were well managed, and those Americans who rented acreage to a Japanese family often counted excess profits from land they would never have farmed themselves. Women helped their husbands in the fields as well as in all the other daily tasks....¹⁵⁶

The San Francisco Women's History Group commented that "by 1910, they had transformed thousands of acres of California desert and swamp land into new farmland. Soon laws were passed preventing the Japanese from owning land and barring them from entry into the U.S."¹⁵⁷

E. Cora Hind, a Canadian born in 1861, carved out a career in agriculture that made her name famous among scientists concerned with crop production and hunger. Her career as an agricultural journalist began in 1898, when a publisher asked her to investigate the effects of recent heavy rains on the wheat crop. She bought a train ticket, and traveled around Winnipeg, observing the wheat fields from the train window. "She became a recognized authority on prairie agriculture and wheat in particular." She

was a phenomenal estimator of the size of wheat harvest and in 1905 estimated the wheat crop at 85,000,000 bushels; it turned out to be 84,506,857. In 1907 she estimated 71,259,000; it was 70,992,584. In 1909 she estimated 118,109,000; it was 118,119,000. In 1932 the *Morning Post* of London wrote: "It would be strange enough if a man of great experience could soberly and accurately forecast the crop ... but that such a faculty would be centered in a woman - this for some reason seems extraordinary."¹⁵⁸

Twentieth century women continued the inventive tradition of women from the 1800s. In 1917 May Conner patented a power-driver fork to lift and deposit hay in its winter storage area.¹⁵⁹ In the same year, Lizzie Dickelman of Forest, Ohio received the first four of eight patents for her inventions for grain storage devices.

Mary Antisarlook, the daughter of a Russian trader and an Inupiaq Eskimo, was selected to be the first American to raise domesticated reindeer in Alaska. The project was the idea of Sheldon Jackson, a general agent of education for Alaska, who pitched the idea in Washington and got funding. Antisarlook, who spoke English, Russian, and Inupiaq, and who had been Jackson's interpreter during a census of Alaska's coastal villages, went to Siberia to learn herding techniques from the Chukchi people.

After returning to Alaska and starting her herd, Antisarlook prospered for a time. At the peak of the enterprise, she may have had as many as 85,000 reindeer and a staff of salaried employees. Difficulties developed, and Antisarlook was forced to give up the

enterprise when the price of reindeer meat was undersold by beef during the Depression.¹⁶⁰

Other women made their contributions to agriculture through scientific research. Geraldine Thiele "invented the first injectable drug to cure shin splints, saving valuable race horses from an early grave. Her equine preparations also led her to patent a mouthwash that prevents human tooth decay, and she discovered a horse feed that keeps manure from smelling bad."¹⁶¹ Cora Downs was the first to identify and establish the cause of tularemia, an infectious disease transmitted by animals.¹⁶²

Women also experimented with new ways of managing farms. Twenty-nine women incorporated as the Montgomery Farm Women's Cooperative Market in Bethesda, Maryland in 1932. By 1945, the group owned outright property valued in excess of \$50,000.¹⁶³

American women continue to take an active role in agriculture. In the introduction to the second edition of *Cowgirls: Women of the American West*, Teresa Jordan noted that since 1979, "the number of women who operate farms and ranches has increased by 10,000... even though the number of farms has decreased." She credits some of this increase to changing social attitudes:

Some part of this increase is probably a matter of reporting and directly related to women's increasing willingness to take credit for what they do – women managers who once told the census taker they were homemakers now feel at liberty to describe themselves more accurately.¹⁶⁴

Eleanor A. Ormerod

Entomologist

England

1828 - 1901

Eleanor Ormerod was a self-taught entomologist who became one of the most celebrated scientists of her time. She specialized in the study of insects that wrecked havoc with field crops and livestock. She developed efficient, inexpensive methods for controlling injurious insects and created the first systematic approach to agricultural insect control.

Ormerod was the youngest of ten children born to a upper class English family. The family's estate was the perfect grounds for studying insects, and Eleanor showed early interest in scientific inquiry. She studied and worked anonymously for decades.

In 1877, Ormerod published the first edition of her *Annual Report of Observations of Injurious Insects*. The 7-page pamphlet, printed at her own expense, was an immediate success, and was reprinted with press runs as high as 170,000, a remarkable figure even today. "Soon agriculturalists throughout the world were corresponding with her, and for the next twenty years she became a clearinghouse for entomological information."¹⁶⁵

Although her research was meticulous and scholarly – she once constructed her own meteorological observation station because she felt climatic data could be useful in her work – her published reports offered common sense remedies utilizing easily available ingredients. The cure for the turnip moth, she found, was a boiled saline solution. Her widely published report for a maggot plaguing livestock – "a dab of cart grease and sulphur applied to the infested area of the hide" – is credited with saving half the cows and oxen in England in the late 1800s.

Her knowledge of injurious insects was so well respected that government officials from Russia to America frequently consulted with her. When the Mediterranean caterpillar threatened widespread destruction of the stored flour inventory in the United States in 1889, the chief entomologist of the Agricultural Department wrote in desperation to Miss Ormerod for the remedy and promptly received this advice: "Get the managers of the steam-mills to turn on the steam to scald them."¹⁶⁶

Following the success of her first pamphlet, Ormerod continued to publish the *Annual Reports of Observations of Injurious Insects* for a total of twenty-four years, from 1877 to 1900. She was appointed consulting entomologist to the Royal Agricultural Society of England in 1882, and held that post for ten years. About that time she also became a popular lecturer. Several series of her talks were published as *Guide to the Methods of Insect Life* in 1884. Ormerod also held the post of examiner in agricultural entomology at the University of Edinburgh, and became the first woman ever awarded an honorary LL.D. by that institution.¹⁶⁷

Henrietta Chamberlain King
Ranch manager, cattle breeder
United States
1832 - 1925

Henrietta Chamberlain King inherited the Texas Santa Gertrudis Ranch when her husband died in 1885. Along with the 500,000 acres of land, she also inherited a debt of \$500,000 incurred by her husband. Using her own business sense and willingness to try new methods, King turned the ranch around, making it hugely successful.

She shipped cattle by rail and induced a railroad to build through her property. She watched scientific developments and was often the first to try them. When drought threatened, she imported a new well-drilling rig that tapped an artesian reservoir and solved the water problem of the ranch forever. Over years of experimental breeding, the King Ranch developed the only authentic new breed of cattle in North America: the Santa Gertrudis strain now used all over the world.¹⁶⁸

As of 1976, the King Ranch was raising cattle on 11.5 million acres in Australia, Argentina, Venezuela, and Brazil, as well as in Texas. The ranch's income derives from diverse activities including oil, race horses, game preserves, and other ventures in addition to the scientific production of beef.

Harriet Williams Strong
Farmer; Invented Water Conservation Dams
United States
1844 - 1926

Like her contemporary, Henrietta Chamberlain King, Harriet Williams Strong inherited a ranch and a pile of debts when her husband died in 1883. Charles Strong had lost the family wealth in his mining pursuits, and while he was off at the mines, Harriet had been left alone to run the ranch and raise their four daughters. Harriet, who had suffered from a nervous affliction for years, was in Philadelphia to consult with a physician about her health when she learned of Charles' death. Returning home with total responsibility now for the ranch and her daughters, Harriet threw herself into projects that would turn her into a wealthy, successful, and respected businesswoman in her own right.

She planted a few orange trees on her land, but most of the land she dedicated to walnut trees, which were a relatively new crop at that time in southern California. Her ranch suddenly became the world's largest walnut orchard – some 25 miles long. Within ten years she was known as "The Walnut Queen." Between the rows of walnuts, she planted pomegranates and pampas grass, crops suited to the arid climate. The pampas grass, which produced decorative plumes, was an enormous hit, and she developed a new curling and dyeing process to meet the market demand for plumes in color and with a silky finish.

Strong's most famous inventions, however, were in flood control and water storage systems. Each year she saw how the heavy spring rains flooded the fields and damaged the crops. The crops that survived the floods were often damaged by drought later in the year. She designed a series of dams, one built below the other, that could control flood waters and conserve water for dry seasons. The tiered design was especially suitable for canyons. What made the design unique was that the water trapped behind one dam would help support the next higher dam, using the pressure of the water itself for structural support and ensuring safety in case of a break. "Strong used her patents and her knowledge of engineering to develop an irrigation and water company in the San Gabriel Valley and became an expert on underground water storage and flood control."¹⁶⁹ Although her design was not widely utilized in the United States, it received international acclaim and "was adopted by engineers as far away as Central America, and received an award from the federal Agricultural and Mining departments."¹⁷⁰

Congress considered using Strong's system as a model for the proposed development of the Colorado River in the Grand Canyon for irrigation and power generation. Strong was called to Washington twice to present expert testimony. The Grand Canyon project was suspended at the end of World War I; however, Strong's "early

advocacy, including the introduction of two bills in Congress, was an important step in the eventual development of the Colorado River, which in turn provided the water necessary for the rapid growth of Southern California as one of the world's great urban and food-producing regions."¹⁷¹

Alice Evans
Medical researcher
Discovered cause of Brucellosis (Undulant Fever)
United States
1917

By the early years of the twentieth century, science had determined that milk was the source of the mysterious disease brucellosis, but they didn't know how the milk became contaminated. The cows producing the milk appeared healthy and the milk showed no signs of spoilage.

Brucellosis was described by one researcher as "common throughout the world, insidious in onset, difficult to diagnose, and marked by recurrent bouts of fever and malaise. It has ruined the productive lives of many persons and is one of the most miserable diseases of man."¹⁷² It was also known as "undulant fever" for the cyclic high fevers it caused in humans.

In 1917 Alice Evans announced that she had discovered the cause of the disease. Furthermore, she had discovered that the bacteria causing brucellosis also caused other diseases that affected livestock, and which had been thought to be unrelated: Bang's disease in cattle, Malta fever in goats. Unfortunately, despite her seven years as a government dairy and health researcher, no one believed her. And when she announced that the way to prevent undulant fever was to pasteurize milk, the dairy industry joined the fray to denounce her work.

Up to that time, pasteurization had been used primarily to prevent spoilage of beer and wine. The contaminated milk didn't appear spoiled, and the dairy industry did not want to invest in expensive and – in its opinion – unnecessary processing equipment.

Evans, confident of her research, continued to press forward. When she

suggested that the cow, not the milk, might be the source of the problem, her theory was resoundingly rejected by her bureaucratic supervisors, who ordered lab tests restricted to milk already known to be contaminated. Alice secretly conducted her own tests of fresh milk drawn directly from the udder, which led to her discovery of the origins of brucellosis. By comparing various cultures of other livestock-transmitted diseases that produced similar symptoms in humans, she established that the various microorganisms were related and in fact constituted a whole new genus.¹⁷³

It was eventually determined that the bacteria causing the disease breed prolifically in the udders of lactating cows who appeared healthy. It could take months or years

before the cow herself showed signs of infection. The heat of pasteurization was sufficient to kill the bacteria and prevent the spread of infection to humans.

It was not until ten years after her initial announcement that other researchers confirmed Evan's theory. In 1928 she was the first woman to be elected president of the Society of American Bacteriologists, and by the 1930s the dairy industry had instituted the standard practice of pasteurization. The incidence of undulant fever dramatically declined.

In 1922, Evans herself was infected with a rare form of the disease, and she suffered recurrent bouts of the disease for over twenty years.

When asked why the leading microbiologist of the time had rejected her research on brucellosis, Evans replied, "The Nineteenth Amendment was not a part of the Constitution of the United States when the controversy began, and he was not accustomed to considering a scientific idea proposed by a woman."¹⁷⁴

Rachel Brown and Elizabeth Hazen
Discovered Nystatin anti-fungal medicine
United States
1950

In 1950 the research team of Rachel Brown and Elizabeth Hazen announced their discovery of the first safe and effective antibiotic against fungal infections. Nystatin, as they named it, was the biggest wonder drug since the discovery of penicillin. It proved useful in treating a wide range of fungal infections that plagued humankind, from ringworm and athlete's foot to life-threatening fungal diseases. It further proved useful in treating Dutch Elm disease, and the food and livestock industries used it to prevent molds in bananas and livestock feed. It was even used to kill molds and mildews growing on priceless works of art after the Arno River flooded Florence, Italy in 1966.

Rachel Brown was born in 1898 in Springfield, Massachusetts. After her father abandoned the family when she was twelve, Brown's mother was the sole source of support for the family consisting of Rachel, her brother, and two grandparents. A wealthy friend of the family financed Brown's college education. She became a chemist at New York State's Department of Health at Albany.

Elizabeth Hazen was born in 1885 in rural Mississippi. Both her parents had died by the time she was three, and she was raised by an aunt and uncle. She financed her education by teaching school for six years. She eventually went to work at the Department of Health Laboratories in New York, where she became the senior microbiologist.

They began their collaboration in 1948, their work "stimulated by the wartime need to find a cure for the fungus infections that afflicted many service men."¹⁷⁵ Hazen was already an expert in the identification of fungi, and they both believed that an effective fungicide already existed in some soils. The trick was to find it.

They divided the work. Hazen methodically screened and cultured scores of soil samples, which she then sent to her partner, who prepared extracts,

isolated and purified active agents, and shipped them back to New York, where Hazen could study their biological properties. On a 1948 vacation, Hazen fortuitously collected a clump of soil from the edge of W.B. Nourse's cow pasture in Fauquier County, Virginia, that, when tested, revealed the presence of the perfect microorganism. In farm owner Nourse's honor, Hazen named it *Streptomyces noursei*, and, within a year, the two scientists knew that the properties of their substance distinguished it from previously described antibiotics.¹⁷⁶

Recognizing that their discovery required the resources of a large pharmaceutical company for proper testing, and wanting to insure that nystatin was made available, Brown and Hazen enlisted the aid of Research Corporation, which holds patent rights for individuals who agree to donate their proceeds to the public interest. Brown and Hazen assigned their royalties to Research Corporation's grants program in the physical sciences and to establish the Brown-Hazen scholarship fund for college students in microbiology, immunology, and biochemistry. Research Corporation licensed E.R. Squibb and Sons to manufacture and test nystatin for 5 years, while the patent application was processed.

The patent was granted in 1957. By the time the patent expired in 1980, it had paid Research Corporation \$13 million. Brown and Hazen received no money from their discovery. They did receive numerous awards, and encouraged other women to pursue careers in chemistry and microbiology.

Asia and Africa

Throughout most of the world, women have contributed much of the agricultural labor, even in the twentieth century.

Women were observed doing heavy labor, including field work, in China in the early part of this century.¹⁷⁷ In Taiwan, peasant women perform agricultural labor, especially during busy seasons. For example, all available women work at gathering and threshing wheat during the harvest, and in Northern Taiwan, "most help on occasion with the planting, weeding, and harvesting of vegetables, and nearly all wives take responsibility for the drying of the harvested rice, the washing of vegetables for market, and the gathering of food for family pigs."¹⁷⁸

A significant proportion of Japanese women work in agriculture. "Historically, most Japanese women workers were employed in agriculture and forestry, primarily in family enterprises."¹⁷⁹ Another writer reported

It may be a revelation to some readers ... that in 1960 the 43.1 percent of Japanese women workers in agricultural occupations was higher than the comparable figure in Ireland of 15.3 percent, gleaned from the ILO's *Economically Active Population 1950-2025*. The explanation lies in the

fact that the relative importance of the roles of women and men as agricultural workers is reversed between the two countries. Thus, in 1960, only 26.3 percent of Japanese men were working in the primary sector – mainly agriculture – which was appreciably less than the 43.8 percent of Irish men in the same sector. The data still seem surprising. It is possible that many of the Irish women who are working on family-run farms do not value their work highly enough or are reluctant to admit to working in the fields. In Japan in the 1960s, meanwhile, women's work was acknowledged to be essential in the agricultural sector.¹⁸⁰

In many Third World nations, food production is still commonly practiced with horticultural techniques, which means that women are frequently the primary farmers. In Burundi, for example, Hutu and Rundi women are responsible for the cultivation of the fields. Although the fields technically belong to the husband, among the Rundi, the wife is the absolute proprietor of the food supply, and no husband would think of taking food without her permission.¹⁸¹ Ethel Albert describes the work of the Hutu women:

During the two or three weeks before the rainy season, a woman leaves the house each day a little after sunrise, pregnant or a baby on her back and another child trailing behind her, hoe in hand. She must prepare the soil and sow the seed. Once or twice during the rainy season, she must weed the peas, beans, and millet. At harvest time, she is very busy for two or three weeks. She must harvest the crops and must carry it from the fields to her yard in bundles of 30 to 50 kilograms on her head; there she must dry and clean what she has harvested. Finally, she stores the food in large storage baskets and brews the sorghum beer.¹⁸²

Between the planting and harvest, women have considerable leisure time. The husband may occasionally assist with planting or harvest, or with clearing fields, but this appears to be a matter of individual preference.

Among the Ibo of Nigeria, women's councils are responsible for "everything concerning agriculture and the interests of women in general. They fix the timetable for all the important agricultural tasks, look after the protection of crops, and regulate all ceremonies involved."¹⁸³

Gender roles for agricultural tasks vary from tribe to tribe. Among the Bambara, for example, men do most of the planting and weeding, while women are responsible for the harvest and preparation of food for sale.¹⁸⁴ Women of the Lele in the Congo cultivate salt-yielding plants, and help plant, weed, and harvest the crops. For the Lele, "the most basic division of social life is between the forest, which is a masculine sphere, and the grassland on the edges of the forest, which belongs to the women."¹⁸⁵

Around the turn of the century, women in Persia (present-day Iran), worked in the fields. One observer reported that "the planting of the rice fields in the mud is done by the women where they often work in a foot of water or mud. They take their share, too, in weeding and harvesting. The fields around the villages may produce wheat, barley, maize,

millet, cucumbers, melons, tobacco, and opium. A great deal of work falls to the women in the way of gleaning and grinding wheat and other grain."¹⁸⁶

Women's agricultural work in India varies considerably according to region. In South India, for example, "women not only participate with their menfolk in farm decision-making, but even more so in productive activities.... Over the years women of the region may have contributed millions of hours at heavy manual labor to create and maintain the irrigation works on which village agriculture depends."¹⁸⁷ In contrast, in central districts of the Punjab,

women work only as casual laborers. Plowing and harvesting of crops is done by men, but women also are frequently employed for cutting crops as well as for picking cotton, plucking maize cobs and millet earhead, harvesting, and stripping sugarcane before it is crushed.

In the southwestern districts of the same state, in contrast, women are willing to do every kind of field work except plowing and carting. They help in preparation of the fields for sowing, breaking clods with mallets, irrigation, making field embankments, and transporting the produce....

In the north, a hilly and the least developed area in the state, women's participation in the fields is the highest. Rice is the main crop. Puddling of fields and irrigation is done almost entirely by women. They also help in sowing, transplanting, weeding, reaping, and winnowing, and carry the crops, vegetables, and firewood on their heads to the market. Often the male members of the family leave for the plains in search of work and leave the women to take care of the farm.¹⁸⁸

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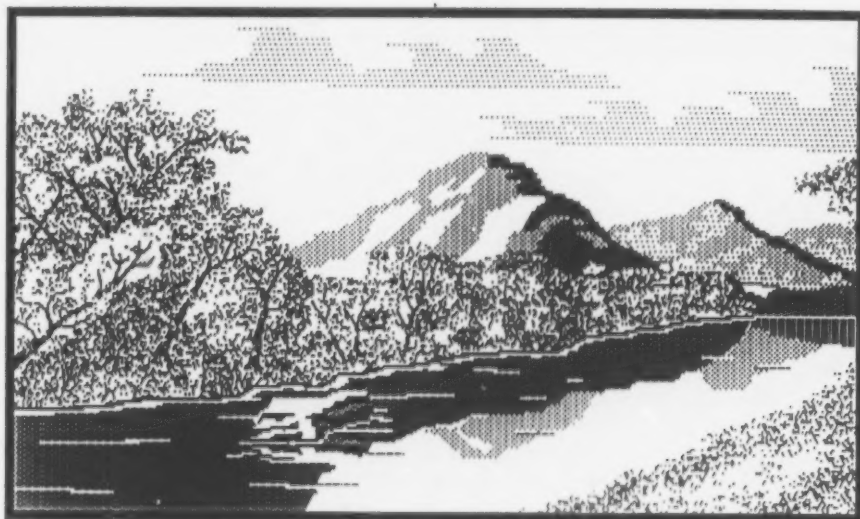
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Hunting and Fishing

Hunter-Gatherers, Ancient and Modern

Archaeological and historical evidence indicate that women were hunters and fishers in a number of prehistoric and ancient cultures. Hunting and fishing women have been documented in 20th century hunting and gathering societies as well.

According to Margaret Ehrenberg, there is much evidence of fishing in the coastal waters of Scandinavia during the Mesolithic and Neolithic periods, from fishbones and fishhooks found in the sites studied. At least one grave, dating from about 3000 BCE at Västernbiers, Sweden, contained the remains of a woman buried with a fishhook. Another grave contained a man with a fishhook, so apparently both sexes were involved in the activity.¹

Ehrenberg also cites the New World example of atlatls (spearthrowers) found in some female burials of the Indian Knoll culture, located in the Midwest and dating from roughly the same time period as the Swedish gravesite. "A variety of arguments were put forward to avoid the obvious conclusion that women, as well as men, hunted: that they had a purely ceremonial function, that they belonged to a platoon of Amazons, or that they were part of the inheritance of some families or groups."² When the simplest or most obvious explanation doesn't fit the observers' preconceptions, they often create imaginative alternatives.

Women also hunted in Catal Huyuk,³ a Neolithic city in modern-day Turkey dating from the 7th millennium BCE, as well as in Minoan Crete, where they are sometimes shown with bows and arrows.⁴ In the Middle Kingdom period of ancient Egypt, women apparently assisted the hunt by acting as beaters to cause wild birds to rise in the marshes.⁵

The Roman historian Tacitus wrote about the customs of several northern peoples in his *Germania*. Of the Fenni, he wrote, "They eat wild herbs.... The women support themselves by hunting, exactly like the men." Ehrenberg points out that "the Fenni sound like a classic hunter-gatherer society."⁶ Tacitus also wrote that in some Germanic tribes the young men and women "are equals in age and strength when they are mated," and some German women hunted alongside the men.⁷

Another Roman historian, Procopius, wrote in his *History of the Gothic War* in the sixth century about another hunter-gatherer group called the Scythifinni, who may be identified with the later Lapps. He says the Scythifinni "neither till the land themselves, nor do their women work it for them, but the women regularly join the men in hunting, which is their only pursuit."⁸

Ehrenberg comments on these accounts:

Although the descriptions of societies such as the Fenni and the Scythifinni are often dismissed as the product of classical imagination and as mythical inversions of Roman values, it seems just as plausible that they were hunter-gatherers, since archaeological evidence shows that hunter-gatherer

societies continued to exist in northern Scandinavia well into this period. There does not therefore seem any good reason to doubt the suggestion that women hunted, and shared other tasks equally with men.⁹

Modern hunter-gatherer societies show many of the same patterns. Among the Mbuti pygmies of the northeast Congo, women and men go hunting together; both also gather vegetable foods when possible.¹⁰ Women and men also hunt together among the Agta of the Philippines.¹¹ The Tiwi group of aborigines on Melville Island of Australia

share tasks in an unusual way. While men are concerned with fishing and procuring food from the sea and the air, women forage and hunt for all forms of "land food," including land mammals. Until the introduction of steel tools, their principal tool was the stone ax, not unlike those used in prehistoric Europe, which they used for a variety of tasks including stripping bark to make baskets and striking death blows to prey animals. Significantly, the women themselves made these stone tools.¹²

Among the Mundurucú of Brazil, men and women also share the work of timbó fishing.¹³

Native Americans

There are numerous instances from many Native American groups of women hunters and fishers. Anthropologist Regina Flannery lived among the Eastern Cree in the James Bay region of Canada during the summers of 1933 and 1935. During that time, she

came to know several old women reputed to have been excellent hunters in the old days. They hunted either because of illness or death of their male relatives or, as the women said but no man ever admitted, because of "just plain incompetence of the men at hunting." While living among the Mescalero Apache in the mountains of southeastern New Mexico, Flannery was told by a "shriveled-up, decrepit old woman" that in the past "young married women might go hunting with their husbands, not merely to accompany them, but actually to take part in the chase." Flannery found it hard to believe that such a woman "was once active and skilled enough to rope a buffalo, wind the rope around a tree, and kill the animal with an ax." However, she received corroborating information from others that in the past this was not an uncommon feat for women who, if they needed food, would kill whatever animals they came upon.¹⁴

Louise Spindler reported that in aboriginal Menomini culture, women who were skilled at hunting and fishing were highly respected.¹⁵ Ruth Landes noted that it was common for Ojibwa women to develop "male" skills, usually out of need due to the death, desertion, or illness of a male relative.

Some women learned to hunt by going out with their fathers when they were girls, particularly if there were no sons in the family, but as for other traditionally men's tasks, such as house or canoe building, the women were self-taught. Yet no matter how frequently a particular male-associated job had to be performed by the women, and no matter how skilled they were at doing it, that job remained classified as a male job. Interestingly, Landes reports that Ojibwa men were often more accepting of an unconventional woman than women were. A woman would look on another woman who was doing men's work as somewhat unusual or extraordinary. Men, on the other hand, would regard such a woman in light of the occupation she followed; to them a woman who qualified as a trapper was considered a trapper....¹⁶

A Cheyenne woman named Iron Teeth, "whose 95 years spanned almost the entire period of white contact with her tribe before 1930," hunted small game on her own and caught wild horses, which she broke and trained herself. She also hunted buffalo with her husband.¹⁷

In Labrador, Canada, during the 1630s, all able-bodied members of the camp participated in collective caribou hunts. Women hunted meat for themselves if the men were away, and they also went hunting with their husbands.¹⁸

The women of many tribes in the North and Northeast had responsibility for trapping small game in snares. This custom contributed to the very survival of many European fur traders. Because the Native women knew how to survive in that environment far better than their European husbands, they often had the responsibility for providing food, particularly when fresh provisions – necessary for the prevention of scurvy – were scarce in the winter. Fur trader George Nelson sent his Ojibwa wife out with a group of other Native women who lived at a rival post during the winter of 1815.

The "she-hunters" returned with all their equipment after about three weeks, having added much to the kettles of both companies. "My woman brings home 8 hares and 14 Partridges," wrote Nelson with satisfaction on March 3, "making in all 58 hares and 24 Partridges. Good."¹⁹

Eskimo women in Greenland traditionally caught caplin in the early summer, when the fish were so thick along the coastal waters that the women could draw the fish into their boats by the buckets-full. Women also participated in the seal hunt as well.²⁰ Fridtjof Nansen reported that on occasion, some women assumed the dress and responsibilities of men:

Captain Holm mentions two girls at Imarsivik in the east coast who had taken to the kaiak. The proportion between men and women in the village was unfortunate, there being only five men out of a population of twenty-one. We are unhappily not informed whether these women had attained as great skill in their hunting as their male comrades.

They had adopted the masculine manner of living, dressed like men and wore their hair like men. When they were allowed to select what they wanted from among Holm's articles of barter, they did not choose needles or other feminine implements, but preferred spear-heads for their weapons. It must have been difficult to distinguish them from men; I doubtless have seen them when I was on the east coast in 1888, without suspecting their sex. Holm mentions that one or two other girls in the same place were also destined to be trained as hunters, but they were as yet too young.²¹

Women in other tribes also took on male identities and lifestyles when they were moved to do so. For example, the Jesuit Father de Smet wrote in 1841 his observation of the Snake tribe's beliefs regarding dreams. A woman of the Snakes dreamed that she was a man who hunted animals. When she woke from the dream, she dressed in her husband's clothes, took his gun and went hunting to test her dream. After killing a deer, she assumed a male role within the tribe as a hunter and a warrior. "She goes on hunts and on the war-path; by some fearless actions she has obtained the title of "brave" and the privilege of admittance to the council of chiefs. Nothing less than another dream could make her return to her gown."²²

An extraordinary woman known as Woman Chief lived among the Crow. Born into the Gros Ventre tribe, she was taken prisoner by the Crow when she was ten years old, and adopted into the household of a warrior. Her adopted father encouraged her interests in hunting and other such activities.

She was in time placed to guard horses, furnished with bow and arrows, employing her idle time in shooting at the birds around and learning to ride fearlessly. When further advanced in years she carried a gun, learned to shoot, and when yet a young woman was equal to if not superior to any of the men in hunting both on horseback and on foot.... Long before she had ventured on the warpath she could rival any of the young men in all their amusements and occupations, was a capitol shot with the rifle, and would spend most of her time in killing deer bighorn, which she butchered and carried home on her back when hunting on foot. At other times she joined in the surround on horse, could kill four or five buffalo at a race, cut up the animals without assistance, and bring the meat and hides home.²³

When her father died, she became the sole support for his family.

Europe to 1900

A medieval treatise on hunting, hawking, fishing, and heraldry, *The Boke of St. Albans*, was first published in 1486. Although the authorship is unclear, at least part of it has been attributed to a nun, Juliana Barnes (Berners), who was the Prioress of Sopewell

Nunnery in England. The second edition of the book indicates that she wrote the treatise on hunting.²⁴

The image of the fishwife selling fish at market is fairly well-known. What is not so well-known is that women also worked as independent fishers during the Middle Ages. A council ordinance in 1388 dealt with the fishing trade: "No fisher, whether woman or man, may have more than two nets, and they must be placed alongside one another...."²⁵ At Alba, Spain, in the Middle Ages, "fisherwomen as well as men cast their nets into the Tormes from those sand spits that were not reserved for the *alcaldes* and other local dignitaries. They divided the catch and then sold it separately, although each could keep the most desirable trout, mullet, and eels."²⁶

During the eighteenth and nineteenth centuries in England, women did seasonal fishing work in pilchard harvests,²⁷ and collected bait for the fishing industry. Bait collecting was an essential component of the Yorkshire fishing industry conducted almost exclusively by women and girls in the fishing villages. They collected several kinds of bait which varied depending on the season and the primary catch. Because it was imperative that the bait be fresh, they collected mussels and limpets at low tide, in every kind of weather, be it rain, cold, snow, or storm. There was competition for dwindling resources between the women of neighboring villages and on at least one occasion, the local officials intervened in a conflict, specifying the days of the week each village could gather bait in the disputed location.²⁸

According to Michael Hiley,

The ceaseless demand for bait drives the fishergirls to extreme measures. To the north of Flamborough Head a high chalk cliff prevented the girls from getting down on the rocky foreshore which was exposed as the tide receded. They could not make their way along under the base of the cliffs and considerable quantities of bait in the form of limpets and whelks lay inaccessible but tantalizingly close – between one and two hundred feet below as they looked down from the cliff edge. The women had solved the problem by climbing up and down the cliffs by means of ropes secured by stakes at the cliff top.²⁹

Hiley quotes from the diaries of Arthur Munby, who befriended several of these fishergirls, where he described how they made the descent. Munby reported that when he visited the cliff top,

I caught sight of Sally Mainprize and her brother, coming towards me at full speed across country, over hedge and ditch. They came up panting and laughing; and asked me to go down with them; which I declined, knowing how poor my climbing would look, by the side of Sally's. So I went to a point near, to see them descend; and they sprang down the steep "trod" to the stake. Here, Sally, who was most picturesquely drest, adjusted her short red petticoat. Gathering the hinder part between her knees, and pinning it up, and tying strings around each knee, she converted the loose cumbersome skirt into a pair of easy serviceable breeches; her brother

standing by, waiting. Then she stood up and shook herself, ready for the plunge: and nothing could be more striking in its way, than those two figures, standing together on that high and giddy crag, and relieved against the blue sea and the sky; he in his tarry trousers and blue jersey; she in her jersey white sleeves, her lilac curtainbonnet, her deeper lilac frock, gathered up around her waist, her scarlet knickerbockers, and her stockings grey. Sally descended first: she disdained any help to start with, and literally *ran* down the first few yards of the incline, which is more precipitous than a house roof, and full of loose stones. Then without stopping she seized the rope, and gaily danced, as it were, letting it slip through her hands, as far as the foot of the incline, where it meets the summit of the main wall of cliff. Here, at the corner of the jutting crag, is a ledge, on which before now I have seen this very girl sit at ease, and whistle to the waves. She now left the rope and sat there, waiting for her brother, who came down much more slowly. Then spitting on her hands (vulgar creature!) and rubbing them together, she firmly grasped the rope, which John held steady for her, and stepped over the edge. Down she went, light and easy as a sailor, for 70 or 80 feet; sticking her toes into any crevice of the chalk wall, swinging by the rope from point to point, or quietly dropping, hand under hand, till she saw herself near the bottom: then, springing backward (for her face was to the rock) with a bound, she lighted firm on her feet, upon the stony platform at the base of the cliff. Without a moment's delay, she picked up her basket, which she had thrown down from above, withdrew her flitherknife, and strode off seaward across the scars [sloping shelves of shale exposed at low tide], to work. But even Sally's practised foot was not always safe on the slippery weed: looking up, and raising her arm to wave me a salute, she slipped and fell sideways into a pool: but was up again in no time, uninjured. It was now eleven o'clock: and after an ineffectual attempt to follow in Sally's heroic footsteps down that dizzy slope, I sat down on the clifftop.³⁰

United States, 18th - 19th Centuries

Throughout the colonization and westward expansion of the United States, isolation and labor shortages forced women to take on new roles and responsibilities. As Alice Kessler-Harris noted, women living on the southern frontier commonly handled rifles, hunted, and trapped.³¹

In the early years of the nineteenth century, western New York state was still a frontier. Lucy Ann Lobdell, born in 1829, assumed responsibility for her family's farm and subsistence as a young adult after her father became disabled. She taught herself to shoot her father's rifle and took up hunting. In 1854 she left her child from a failed marriage with her parents, and struck out on her own. In her autobiography, she explained,

First, my father was lame, and in consequence, I had worked indoors and out; and as hard times were crowding upon us, I made up my mind to dress in men's attire to seek labor, as I was used to men's work. And as I might work harder at housework, and get only a dollar per week, and I was capable of doing men's work, and getting men's wages, I resolved to try ... to get work away among strangers.³²

"She continued to follow the life of a trapper and hunter and spent several years in Northern Minnesota among the Indians."³³

Annie Oakley, of Wild West Show fame, also taught herself to shoot in order to contribute to the support of her family. Growing up in Ohio in the 1860s, she hunted small game in the countryside around their rural home, and began selling quail, grouse, and pigeons as far away as Cincinnati. The fancy hotels particularly liked buying her birds because she always shot them in the head without damaging the breast meat.³⁴ Her incredibly accurate aim was developed early, and would eventually make her one of the most famous women of her time.

Women settlers and homesteaders in the western expansion took on the tasks of fishing, hunting, and trapping whenever necessary to feed their families. Sarah Olds, a Nevada homesteader, took over the trap lines when her son fell ill, and recalled her first experience as traumatic.

"On my first trip around the trapline I caught a bobcat.... I hadn't expected to catch anything, and now I was faced with the task of killing what I had caught.... For a while I stood there and bawled good and loud..." She finally stunned the animal with a tap behind the ear, followed by a death blow to the heart.³⁵

Margaret Mitchell Womer, who grew up on a Kansas homestead in a family of six girls and three boys, recalled that she and her sisters hunted and set traps. "We used to set traps on the banks of the Republican and caught wolves, badgers, bobcats, and skunks. Wild turkeys were very plentiful then and we sometimes used traps to catch them.... We saw many large herds of buffalo as they came to the river to drink, and occasionally were able to shoot one."³⁶

Some women made a career out of hunting. Martha Maxwell was a taxidermist who shot and trapped all the animals she stuffed. According to Sandra Myres,

a few skilled outdoorswomen joined the hunting parties. The most unusual of these "dead eye Dianas" were four young Southern women who joined Thomas Potter's overland company "for the purpose of hunting large game such as buffalo, elk, and antelope." Dressed in bright red bloomer suits, these remarkable young ladies "kept the train well supplied with antelope meat" and even put on a shooting demonstration for a band of Snake Indians. Their extraordinary ability was quickly recognized by the men of the party who agreed the women should have a voice, along with the men, in the party's organization and governance.³⁷

Whaling

The whaling industry was a major contributor to New England's economy in the late eighteenth and early nineteenth century, and women participated in whaling in a variety of capacities. Martha Smith was a New England entrepreneur who, according to historian Alice Kessler-Harris, "almost single-handedly built the whaling industry."³⁸

It was not uncommon for the captain's wife to live aboard the whaling ship, and many of them took on responsibility for navigation. In fact, women's schools in New England commonly taught navigation as an appropriate skill for women. One whaling captain's wife was Honor Earle, who was officially rated as ship's navigator on the *Charles W. Morgan* when she sailed with her husband between 1890 and 1906. She said, "A whaler, you know, is not the place to have the liveliest time in the world, so I applied myself to learning navigation."³⁹

Other women took an even more active role. Linda Grant De Pauw discovered that

At least one woman took over her husband's whaler. Her account book records a month in which her share was fifty-two barrels of whale oil: "Feb. ye 4, Indian Harry, with his boat, struck a stunt whale and could not kill it, – called my boat to help him. I had but a third, which was 4 barrels. Feb. 22, my two boats, and my son's, and Floyd's boats, killed a yearling whale of which I had half, – made 36, my share 18 barrels. Feb. 24, my company killed a small yearling, made 30 barrels."⁴⁰

De Pauw also reported that "a small number of women whalers went in the boats, sweated in the blubber rooms, and did all the work of the regular crew. These women were not captain's wives, but sailors who joined the crew after disguising their sex. So long as the disguise was effective, they lived in the forecastle."⁴¹ De Pauw noted that in some cases, the motives of women who worked as whalers must have differed from those of the women who, disguised as men, worked as sailors on merchant ships or warships. Unlike other types of ships, whalers didn't go anywhere and they took a long time doing it, so working on a whaler was not a way to gain free passage somewhere, whether it be to escape from family pressures, follow a lover, or seek adventure. There wasn't a lot to do on whalers, either, and a long time to do it in. Women who worked on whalers probably did it for the same reasons men did – they liked the life.

According to De Pauw, the first woman known to have worked on the crew of a whaler signed aboard the *Lydia* in the late 1700s. "When the ship returned to Nantucket from a successful whaling voyage off the coast of Brazil, the captain reported, as a matter of special interest, his discovery that one of his crew, who had sailed two voyages undetected, was a female. Her name was not recorded."⁴²

One woman signed aboard a whaler because she wanted to follow a man. When her lover jilted her and signed aboard a whaler, she found that a man matching his

description was aboard the *Mitchell*, so she donned men's clothing and went to join him. According to De Pauw,

By the time she discovered that he was not aboard, the ship had cleared the harbor and it was too late. So she made the best of it. She knew nothing about whaling or sailing, of course, but neither did about half the crew. So-called greenhands normally made up a good part of the manpower on every whaler. They learned quickly enough if they wanted to stay alive, and the female "greenie" was soon climbing the rigging, pulling an oar in the whale boat, and cutting into the slippery back of a whale to slice off blubber. When the *Mitchell* rounded the Horn at the tip of South America and was caught in a snow squall, she made a reputation for herself by being the only hand willing to climb out to cast off the halyards to loose the foretopsail and main while all the rest were hanging on to the weather rigging for dear life and would not go no matter how much the captain yelled and threatened.⁴³

Apparently the officers liked her, but the crew did not because she didn't fit in by swearing or telling lewd stories, but no one suspected her sex until she fell ill off the coast of Peru.

As she lay delirious on her bunk in the tropical heat, she pulled open her shirt and the tight corset cover she had worn since leaving port eight months earlier. The other men around her were asleep, but one of the hands on watch came below to fetch his pipe. He took one look, ran to tell the mate, and within minutes every man aboard had had a look and confirmed the fact that there was indeed a woman among them. The captain put straight into port and dropped her off at Lima.⁴⁴

Another woman dealt with her situation quite differently. She is known to history only as George Weldon, and she fit right in with the rest of the crew aboard the whaler *America*, which sailed in the nineteenth century. She "swore, told dirty stories, got into fights, and drank and gambled whenever there was an opportunity."⁴⁵ She did her share of the work as well, but somehow bad feelings developed between her and the third mate.

Their quarrel reached a crisis one day when Weldon was rowing in the third mate's boat, pursuing a whale with an iron already in it, and Weldon missed a stroke. The mate swore, and instead of accepting the tongue lashing, Weldon drew a knife and started for him. That was mutiny, the gravest of all crimes at sea, and when the boat returned to the ship and the incident was reported to the captain, he decided that a flogging was in order. That was when George Weldon asked to speak to the captain in private. There was no flogging on the *America*; the sailor accused of mutiny was sent back to work as though nothing had happened. The captain noted in his log, "This day I found George Weldon to be a woman."⁴⁶

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- ¹⁵ Sanday, 126.
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Manufacturing and Processing - An Overview

Prehistory

The history of women's contributions and participation in manufacturing and processing is older than history itself. The traditions of many cultures attribute the invention of significant technologies and processes to various goddesses. For example, the "Egyptian goddess Isis... invented bread and the process of making linen..."¹

Isis was just one of many. Brigit, a goddess of the Irish Celts, is said to have invented metal smithing, as were the Dactyls, "Ten little women [of Greece who] were fabulously inventive and brought to us all we know of metalwork and smithcraft. The Dactyls clearly represent the 10 fingers of the human hands; their legends suggest that women were the discoverers of metal and its working."² The Mayan moon goddess Ix Chebel Yak taught women the arts of spinning, weaving, and dyeing. Another Mayan goddess, Mayahuel, discovered the process of fermentation and brewing.

These may just sound like fanciful myths, but perhaps they should not be dismissed lightly. As we saw in Agriculture, they may actually point to real contributions women made to civilization.

The earliest forms of manufacturing and processing were done on a subsistence basis to meet the basic needs of survival for small groups of people usually related by kinship. This probably involved the creation of tools used in the gathering of food. According to archaeologist Margaret Ehrenberg,

One of the most significant human tools must be the container. Whether it be a skin bag, a basket, a wooden bowl or pottery jar, it allows us to carry items around or store them safely in one place. The container may have been one of the earliest tools invented... The development of a sling for supporting the infant, found in almost all modern societies, including foraging groups, is likely to have been among the earliest application of the container.³

The container is also essential in a foraging lifestyle for collecting and carrying food. However, because early containers, as well as other basic foraging tools such as digging sticks, were made of materials that decompose – such as leaf, wood, or skin – little physical evidence is found in archaeological sites.

Much of the archaeological evidence for early tool manufacture consists of primitive worked stone implements, such as flakes of flint and hand axes. Although early theories regarding the use of these tools held that they were involved in hunting and the processing of meat and leather, detailed examination revealed that many of these tools were actually used to process plant foods.⁴

In most foraging societies, the activities of food gathering are divided by gender, with women gathering plant foods and small animals; men hunting larger animals. Studies

of modern foraging societies have shown that plants supply 60 - 80 percent of the group's food needs.⁵ It is now believed that prehistoric foragers also relied primarily on plant foods. With regard to tool invention and usage, Ehrenberg notes that since women were responsible for food gathering, they "would have been in a position to hit upon the various stages toward the cultivation of plants, as well as all the vital concomitant inventions associated with it, such as the hoe, and storage and preparation procedures."⁶ She goes further to say that the

role of women as tool inventors, perhaps contributing many of the major categories of tools which are most essential even today, cannot be dismissed⁷.... It can therefore be argued that the crucial steps in human development were predominantly inspired by females. These include economic and technological innovations...⁸

As discussed in detail later, this applies not only to the development of agriculture and animal husbandry, but architecture and the building trades as well. Science begins to point to the truth behind the myth.

Europe, 10th - 18th Centuries

Scattered through the written records of ancient civilizations are tantalizing references, tiny glimpses of women's activities in trades, often mentioned in passing, with little detail to provide a clear picture. These include the women plumbers of Rome and women metalworkers in Greece; they will be covered more in other sections. In general however, "in the centuries before 800, women found themselves in the least skilled and least prestigious, least lucrative aspects of production, in those aspects most vulnerable to economic fluctuations."⁹

It's not until the Middle Ages, however, that researchers have been able to uncover enough information to give a fuller picture of women's work lives. While the Middle Ages – the thousand-year period between the fall of the Roman Empire and the emergence of modern Western Civilization – have traditionally been called the "Dark Ages," and were assumed to have been a stagnant period, new research has revealed that they were a lively and creative time in the history of Europe.¹⁰

Throughout the Middle Ages, the vast majority of the population was engaged in agriculture, but some villages were growing into towns and cities, centers of trade and commerce. It was in these growing urban centers that we find women engaged in an impressive diversity of trades and crafts.

The basic unit of craft activity was the family workshop, which was run as an integral part of the home. "Apart from brewing, the craft world was dominated by males, but in the family production unit that prevailed, wives shared work with their husbands and widows often succeeded them. Some married women worked at trades of their own; single women occasionally worked at crafts as *femmes soles* [independent women] and enjoyed a status of recognized equality."¹¹ We find records of women in mid-fifteenth

century Strasbourg, for example, licensed to work in the capacity of blacksmith, gardener, goldsmith, wagoner, grain dealer, tailor and cooper.¹²

Outside the textile industry, centered in Flanders and Italy, and apart from domestic service, working women were employed mainly in two great groups of trades. The first consisted of the hundred-odd crafts – shoemaker, furrier, tailor, barber, jeweler, chandler, mercer, cooper, goldsmith, baker, armorer, hatmaker, saddler, harnessmaker, glovemaking – in which women worked side by side with men, usually, but not always, their husbands. In some ways they dominated or even monopolized the work – as in the silkmaking crafts of Paris and London.... The second great group of women workers clustered around the manufacture and sale of food and beverages.¹³

"In Frankfurt, from 1320 to 1500, women participated in no fewer than 201 occupations; of these, they monopolized 65 kinds of work, predominated in 17, and equaled men in numbers in 38."¹⁴ According to Merry Wiesner, "There were women who worked in nearly every craft in some city at some time,"¹⁵ most of whom were widows, wives, daughters, or maids of master craftsmen.

From 1150 until the early 1300s, the population of Europe grew steadily, accompanied by increases in both agricultural and craft production.¹⁶ "Beginning as early as the twelfth century in many cities, certain crafts began to form themselves into guilds, which set quality standards for their particular products and regulated the size of workshops, the training period, and the conduct of their members. In most cities the individual guilds achieved a monopoly in the production and sales of one particular product."¹⁷ The training period for a person entering the trade was an apprenticeship, which might last as long as seven years in some trades. During that time, the apprentice lived with the master's family and worked in his shop. Following the apprenticeship was the journey period, which lasted as long as the apprenticeship. Generally, journeymen were not allowed to marry, and they also lived in the master's household. After completing the time required for a journeyman, the person could make their masterpiece, and if it was accepted by the masters of the guild, they were accepted as free members (no longer bound to a master), and could start their own shop.¹⁸

In the earliest ordinances of most guilds, both male masters and female masters are specifically mentioned. Women masters paid the same fees and met the same civil responsibilities as male masters; however, they usually did not have voting privileges and did not hold office. While it appears that some of these female masters achieved their position through the apprenticeship system, most of them learned their skills by working alongside their husband or father. When the male master died, his widow often took over the shop, and continued in business under her own name as a member of the guild until she retired or remarried. In some cases the widow actually worked as a skilled craftsman; in others, she acted as manager, employing journeymen to do the production work.

The rapid expansion of the twelfth and thirteenth centuries ground to a halt in the fourteenth. A sudden climatic cooling known as the "Little Ice Age" happened early in the

century, leading to a "great famine" in 1315-17. That was followed by the Black Death which began in 1346, and continued to resurface periodically for the next hundred years.¹⁹ The plague killed nearly one-third of the population of Europe. Economic and population recovery didn't begin until the mid-fifteenth century. In the meantime, the economy had undergone considerable reorganization. Major banks had failed, and "textile manufacture in Flemish and Italian cities and maritime trade fell off sharply before 1330.... Resources and wealth were redistributed as established commercial centers passed their peak and new rivals prospered: for example, English producers gained a substantial share of a diminishing cloth industry, while Portuguese and Castilian shipping burgeoned in 1400."²⁰

The effect these changes had on women's position in the guilds continued for the next two hundred years. In the mid-fifteenth century many guilds expanded their ordinances, and references to female masters and girl apprentices disappeared. "The only woman explicitly mentioned in many of these ordinances was the master's widow, and her right to run the shop was usually limited,"²¹ sometimes to as little as two months.

Generally by the mid-sixteenth century, widows in most crafts could no longer take on apprentices or retain more than one or two journeymen.... By the seventeenth century some guilds flatly forbade widows to use any journeymen at all, in attempt to keep their shops as small as possible.... It is no surprise that widows as a rule ran smaller workshops and had a smaller income, even when allowed to continue working independently.... [In Nuremberg] over two-thirds of the widows paid the smallest amount of taxes, a statistic repeated in other cities as well, at a time when 20-25 percent of the households in most cities were headed by women, most of them widows.²²

The precise timing of these changes varied somewhat from city to city and craft to craft. The effect was the same, however: in nearly every craft, women were gradually restricted in their activities, and eventually pushed out all together, or relegated to the lowest paid and most unpleasant aspects of the trade. In fact, Merry Wiesner states that excluding women "was a major aim of many crafts during the sixteenth and seventeenth centuries."²³

The introduction of new technologies also played a part in the gradual exclusion of women from many guilds. Technology has often been a double-edged sword in the arena of women's economic lives. The first edge was evident in the textile industry as early as the end of the thirteenth century in France, when the Parisian guilds began to consider the weaving of "oriental tapestry" too arduous for women. In fifteenth and sixteenth century England, women were "prohibited from working certain fabrics, from being trained in the use of the new machines. For example, in 1511 the Norwich worsted weavers insisted that the new looms that could weave pieces twenty to forty yards long and more than a yard wide required more strength than women could manage. 'Whole cloth' increasingly became the province of men, leaving only the bands and ribbons of the smaller looms for women to work."²⁴

The issue of strength may have been a specious reason for excluding women from lucrative trades. In Russia, "women have done heavy work in agriculture for two hundred

and fifty years" and it was generally believed that women "were physically capable of doing the same jobs as men, and they did work in the mines and in heavy industry" from at least the eighteenth centuries to the early part of this century.²⁵ In the British Isles women worked underground in coal mines for several centuries, hauling loads of coal on their backs. One observer noted, "such is the weight carried, that it frequently takes two men to lift the burden upon their backs."²⁶ In 1868, women ballast diggers in England dug and hauled up to twelve tons of clay per day.²⁷ This was all brutally hard and often dangerous physical labor, and it is probably not desirable for anyone, man or woman, to have to toil under such conditions. Nevertheless, women clearly are capable of heavy physical labor, especially when they are raised to use their bodies and develop their physical strength.

Most of the challenges to women's participation in the crafts came from the journeymen, who were also feeling the pressures of the social and economic upheavals. "As opportunities declined in the sixteenth century, the only way for a journeyman to become a master himself was to marry the widow or daughter of a master"²⁸ because the guilds were not allowing the establishment of new shops. Journeymen were faced with the prospect of being wage earners all their lives, with no opportunity for advancement. In response, they formed their own journeymen's guilds, and began making their own regulations and demands. Their regulations concerning membership became even more restrictive than the craft guilds' regulations; their goal was to "exclude as many people as possible from working in the shop so that there would be less competition for workplaces."²⁹ Wiesner outlines the continuation of their efforts:

Journeymen next turned against...the women working in the shop. They first demanded that all maids be forbidden to work, then that the master's own wife and daughters be excluded or that the tasks they did be limited to finishing and packing or other unskilled jobs. Rather than request that their own wives be allowed to work with them, they demanded instead that all women be excluded from the shop. This included the master's widow, for journeymen's guilds often forbade their members to continue working for widows longer than a few weeks.

These demands went beyond, and in some cases even worked against, the journeymen's own economic interest. They lost work places when widow's rights were limited, and their wives could not work at a trade for a decent wage but were limited to domestic service, laundering, selling at the market, or other low-paying occupations. We can only understand these moves by recognizing that women working in the shop not only represented an economic threat but also had a symbolic or ideological meaning for the journeymen.

The women of the household – the master's wife, daughters, and maids – were a symbol of the patriarchal system that everyone in the household, including journeymen and apprentices, worked under. Attempts to limit the power of the patriarchy – the power of the master – often struck first at the most vulnerable part of the patriarchy, the master's female dependents. As journeymen's work became proletarianized – that

is, as their chances of ever becoming masters dimmed and they could expect to remain wage laborers in a master's shop their whole lifetimes – journeymen attempted to save a shred of their old position and honor by sharply differentiating their work from that of women. What they did in the shop, whether it required much training or not, was to be a male province.³⁰

Women's position in the crafts was affected by other factors in addition to the journeymen's fears of women taking men's jobs; these factors included "interguild rivalries,... worries about competition from guilds in other cities, conflicts between masters and journeymen or between masters and the city council or journeymen and the city council."³¹ Women's right to their own livelihoods became the playing ground for diverse struggles.

As we will see in other sections, this struggle plays out repeatedly, from the effects of the Industrial Revolution to women's work in war industries in both World Wars.

Europe: Industrial Revolution, 1760-1914

Two "revolutions" took place in England during the eighteenth century, radically changing the nature of work. The enclosure movement, which took most agricultural lands out of common holding, created large estates that made the development of modern agriculture possible. Land owners began to experiment with new methods of farming. As we saw in the section on agriculture, land-owning women were active participants in these experiments. The peasantry who had lived by farming and herding on the commons, however, were severely displaced by these changes. Some tried to survive by becoming day laborers on the new farms; many others moved to the cities to become the labor force fueling the second major development of the century, the Industrial Revolution.

The Industrial Revolution introduced a new form of capitalism based on the factory staffed by wage earners. The factories required large sums of money to start up, putting ownership out of range of all but the wealthy, and began production and manufacture on a new grand scale. The result for England was tremendous economic growth and new international power. The effects of the Industrial Revolution spread slowly to the rest of Europe and the United States; most of Europe was relatively unaffected until the last quarter of the nineteenth century.³²

In England through most of the eighteenth century, most working class families still worked together as a unit, either in farming or in home-based shops. As in the Middle Ages, women learned skills from their fathers and husbands, and shared in the family work. "Goldsmiths' daughters, for example, were frequently skilled in designing and chasing, and furniture makers, stone masons, and engravers brought up their daughters to assist them in carving, sculpture, drawing and gravings."³³ The master's wife continued to be an essential part of the business, usually managing the business end of the enterprise. Most trades families hired domestic servants to handle household chores so the wife could be free to manage the business.

Over the course of industrialization, all this changed, however. The workplace moved from the home to the factory. Men and, to a lesser extent, women and children began to work outside the home. Overall, the result for women was fewer employment opportunities. As in the Middle Ages, women were excluded from learning new technologies. Bigger and better machines, often steam-powered, eliminated the need for the skilled masters of many trades, but remained the exclusive domain of male workers and created new positions for those who were skilled machine operators.

Ivy Pinchbeck saw other causes of women's movement out of the workplace:

Except in the trades conducted chiefly by women, the tendency was for women's activity in the business sphere to decrease during the period of the Industrial Revolution. This was due first to social changes following the increase in wealth, and secondly to the reorganization demanded by commercial and industrial changes. When the home was separated from business premises women ceased to take an active share in their husbands' affairs and so lost the experience they would otherwise have gained. At the same time the development of large scale business and the need for greater capital made it increasingly difficult for women, even in their own trades, to set up in business on their own account.³⁴

While there is no doubt truth to that analysis, Ann Oakley saw it somewhat differently. She described the development of a new paradigm for women's role, and a specific chain of events that pushed women out the workplace during the mid- to late-nineteenth century, laying the groundwork for the issues we face today.

Until the early 1840s, the ideology of married women's economic dependence on men, and their restriction to household work and childcare, existed only in embryonic form. The daughters and wives of upper- and middle-class men had not been expected to work for some time. Productive work was denied them, as were the duties of household work and childcare. "The practice of female idleness spread through the middle class until work for women became a misfortune and a disgrace." Working-class women were not restricted in this way. Although opportunities for women's productive work had diminished, there was as yet no generally accepted ideology of women's situation to justify the contraction of their roles as productive workers on moral, social, economic or political grounds.

The first clear signs of this ideology emerged in 1841, when factory reformers enlarged their frame of reference to include not only the work of children, but the work of women as well. In 1841, a committee of male factory workers called for the "gradual withdrawal of all female labour from the factory", an appeal which apparently gained some political support. In 1842, the Report of the Royal Commission on the Mines, with its description of the working conditions of women and children in the collieries, "shocked and horrified the whole of England." "Chained, belted,

harnessed, like dogs in a go-cart," said one Commissioner about women colliery workers, "black, saturated with wet, and more than half-naked, crawling upon their hands and feet, and dragging their heavy loads behind them – they present an appearance indescribably disgusting and unnatural." This dramatic report – coloured by the upper-class idea that women's proper place was in the home – made it appear that the employment of women outside the home was an evil in itself.

The 1842 Mines Act – the first Act of protective legislation for women – excluded women from colliery employment. Two years later, the 1844 Factory Act took the radical and unprecedented step of classing women of all ages with children and "protected persons." Their hours of labour were restricted to twelve a day in the textile trades. In 1847, a further Act limited labour to fifty-eight hours a week for women and young people over thirteen, and an Act of 1850 made the ten-hour day for "protected persons" effective by abolishing the shift or relay system. Much later, in 1891, an Act was passed prohibiting the employment of women four weeks before and four weeks after childbirth, and the 1895 Factories and Workshops Act prohibited overtime for women.

This protective legislation was both a cause and effect of industrialization's most important legacy to women: the creation of the modern housewife role. Over the period from 1841 to 1914 the greatest change in women's occupations was the rising incidence of housewifery as the sole occupation for married women. In 1851, one in four married women (with husband alive) was employed. By 1911, the figure was one in ten.

The increase in the proportion of women occupied solely as housewives is associated with the rise of the belief that woman's place is, or should be, exclusively the home. As one historian has remarked, "The doctrine that woman's place is in the home is peculiarly the product of a period in which man had been largely displaced from the home as his workplace." Victorian attempts to get women out of the factories and mills and into the home were motivated largely by the anxiety of men whose situation had been radically transformed by the change to factory production. The loss of traditional work roles and the new restrictions on the labour of children caused a major crisis in the life and unity of the family. The child's increasing dependence upon adults and the continuing limitations imposed by women's reproductive role came to entail a division of labour between husband and wife, whereby the husband became the main breadwinner, and the wife the main childrearer, living off, and providing for her children out of, the earnings of the man. In this situation the woman factory worker posed the threat of competition. The fear of this threat seems to have been the force behind the early legislation affecting women's employment. At this time, the case for restricting women to unpaid work within the home first began to be argued publicly.

Four main reasons appear in contemporary documents as grounds for restricting or preventing the employment of women outside the home (and encouraging them to busy themselves solely with housewifery). Female employment was condemned on moral grounds, on grounds of damage to physical health, on grounds of neglect of home and family, and, lastly, simply on the grounds that it contravened the "natural division" of labour between the sexes.³⁵

Thus, the Industrial Revolution was a major factor in the historically recent development of the concept of woman as homemaker and the man as the breadwinner.

As industrialization progressed, some new opportunities were created for women's employment through the process of de-skilling. In a number of trades including printing and light metal work such as clock and watch making, new machines were developed that broke the manufacturing process into its basic processes. These new machines further eliminated the need for skilled craftsmen and operators, and opened new jobs for unskilled workers. In many cases these unskilled workers were women, who could be paid less than men (since women were considered secondary wage earners), and were not expected to remain in the labor force beyond marriage or the birth of children. Though men often maintained that women were taking their jobs, in truth, the jobs themselves had changed and few skilled men were willing to take those positions.

During the 1800s and into the modern period, women in the regions of Kosovo and Montenegro (modern Yugoslavia and Albania) had an unusual employment option. According to Dell Richards,

A woman could avoid marriage and become a respected member of the community by taking on the mantle of a "sworn virgin." As such, she renounced traditional heterosexual marriage, vowed to remain chaste, and donned male clothing. In her new role, she was also allowed to carry weapons and to work in trades that were reserved for men.

For economic reasons, some sworn virgins were actually designated at birth in families with no sons. A young girl would sometimes choose to take on the role when a father or eldest brother died. She then became the head of the household and took on all the rights and responsibilities of the position.³⁶

American Colonies: United States and Canada, 17th - 19th Centuries

The first women in the Americas contributed significantly to the material needs of their families and communities. In some tribes, it was the women who were responsible for building houses, boats and canoes. They were often the ones who provided the bulk of their community's food needs by gathering wild plants, growing domesticated ones, hunting small animals, and fishing. They often manufactured every item they used – horn spoons, baskets, pots, needles, woodenware, and clothing.³⁷ To a large extent, the

success of the early fur trade in Canada and the United States colonies can be attributed to the contributions of the Native American women who joined the European traders. Their skills in treating and processing furs, building and steering canoes, hunting small game, and collecting plant foods contributed not only to the success of the fur trade, but to the very survival of the European *voyageurs* as well.

As in Europe, the economy of the American colonies was heavily agricultural. In fact, "until the end of the eighteenth century, well over 90 percent of the population lived on the land."³⁸

Until at least the middle of the eighteenth century, there was little market for the exchange of goods, and households operated as units of production centered around the self-supporting farm or artisan's shop. Food, clothing, and furnishings emerged from the efforts of every household member. Most families produced nearly all of their household goods. Very few families produced for the "market" or for sale, although some of their grain surplus might purchase some things such as rum, coffee, tea, salt, sugar, and potatoes. And some surplus might be necessary to pay for the services of the occasional lawyer or minister, or for the journeymen, tradespeople, and artisans who provided articles difficult to make. Some households made their own boots, while others relied on itinerant shoemakers. Rudimentary carpentry, soap and candle making, spinning, weaving, sewing and knitting, were the province of every household.

A surprising amount of flexibility existed in the tasks people did. Although women's efforts usually focused on work in and around the home, it was not unusual for a woman to pitch hay at harvest time or to plow in the spring. Similarly, men spent twilight hours alongside their wives at the loom, and through the eighteenth century, boys, like girls, were trained to spin and weave. A division of labor by sex, though common, was not rigid.³⁹

In such an economy, the colonial woman had to be skilled in a great variety of tasks. "Her work began at sun up and continued by firelight into the night. Almost everything her family ate and used was produced at home under her direction. Working beside her husband, she grew the food; fetched the water; made the clothes, candles, and soap; raised the children and tended the sick. The Colonial American woman might also keep the books, shoe the horses, trim the tin plates, and operate a saw or grist mill. And she could handle a musket when need be."⁴⁰

The growing towns and cities offered more opportunity for the development of skilled trades, and it is there that "skilled crafts became the basis of the household economy. In the homes of the blacksmith, the shoemaker, the silversmith and pewterer, the tailor and milliner, the shop normally occupied one part of a dwelling establishment - sometimes the front or basement."⁴¹

European colonists brought with them the systems of manufacture they had known in Europe, including guilds and the apprenticeship system. "While in the Old World crafts

guilds had been strong enough to regulate access to the trade to all but those they certified, in America a chronic labor shortage and geographic dispersion deprived guilds of such power."⁴² Apprenticeship, the traditional source of training, "was normally closed to women." As in the early medieval period in Europe, a

father might teach his daughter his own lucrative occupation, and an enterprising wife would certainly learn all she could about her husband's craft. The chronic shortage of skilled labor and a family system of production encouraged sharing such knowledge with women. These factors account for the occasional female blacksmith, silversmiths, gunsmiths, tanners, and printers who, toward the end of the colonial period, seem to have served regular apprenticeships. But most women learned their crafts at a father's knee or a husband's bench. There being as yet little fear of competition from women, small incentive existed to drive women who "stole" a trade out of it.⁴³

Barbara Mayer Wertheimer commented further on the variety of occupations held by colonial women.

Women also ran sawmills and gristmills, caned chairs and built furniture, operated slaughter houses, printed cotton and other cloth, made lace, and owned and ran dry-goods and clothing stores.... Women ground eyeglasses, made netting and rope, cut and stitched leather goods, made cards for wool carding, and even were house painters. Often they were the town undertakers, a job rarely held by women today. Records indicate that women worked in paper mills... and that women barbers served both male and female customers.⁴⁴

In the nineteenth century, as the population increased and manufacturing became more industrialized, many women found work in factories, especially in textile mills. There were a number of other occupations open to women as well. In 1836 "the committee of the National Trades' Union, which was appointed to inquire into the evils of female labor, reported that in the New England states, 'printing, saddling, brush making, tailoring, whip making, and many other trades are in a certain measure governed by females,' and added that of the 58 societies composing the Trades' Union of Philadelphia, 24 were seriously affected by female labor."⁴⁵ Most likely, this meant that a number of trades had experienced de-skilling as a result of industrialization, and women had been hired to fill the resulting tedious jobs.

In the South, African-American slave women "worked in foundries and saltworks, pulled trams in the mines, and put ore into crushers and furnaces. They were lumberjacks and ditchdiggers."⁴⁶

During the nineteenth century, we also find records of women proprietors of manufacturing establishments. The 1871 census in Canada, for instance, listed several such companies.

The largest enterprises headed by a woman in 1871 was Marianne Supple's saw mill in the village of Pembroke, Renfrew County, Ontario, in which 20 men and two boys were employed producing lumber valued at \$150,000.... Esther Ennis of the hamlet of Ennisville, Drummond Township in Ontario's Lanark County, was named as proprietor of three establishments: the flour mill, saw mill, and oatmeal mill together employed 24 men and reported products worth \$46,670.⁴⁷

Other women owned saw mills, flour mills, metal shops, brick yards, salt works, leather goods and wood products businesses. Many of these women were widows continuing the business after the death or incapacitation of their husbands.

During the nineteenth century boom of industrialization, the United States experienced a great flurry of inventive creativity as businesses actively sought new products to manufacture. Women got into the act, and during the last half of the century, feminists put much emphasis on the achievements of women inventors. While many women's inventions fell within the spheres of activity deemed most appropriate for women, a considerable number of women made significant contributions to heavy industry, mining, and transportation. Mary Walton (rail transportation), Margaret Knight (industrial machinery), Martha Coston (maritime signal flares), Carrie Emerson (mining) and others will be discussed in later sections.⁴⁸

Europe and the Americas: Twentieth Century

Many people have heard of "Rosie the Riveter," the symbol of women working in the war industry in World War II. A severe shortage of male workers and increased orders for military equipment and munitions resulted in the need for industry, in the United States, Canada, and Europe, to recruit women for industrial jobs that had previously been regarded as "men's" jobs. What fewer people realize is that the same phenomenon occurred during World War I, although on a somewhat smaller scale.

In the United States,

the rapidly expanding war industries dipped heavily into the reserve labor force of women. At the end of 1918 nearly three million new women workers were employed in food, textile, and war industries. Many taboos and restrictions thrown up to keep women out of large-scale productive industry were broken down. Women worked as streetcar conductors and radio operators, and in steel mills and logging camps during the war.⁴⁹

African-American women were particularly affected by these developments. Prior to World War I, they worked primarily in unskilled jobs

in small numbers in the clothing, food, and metal industries. They were to be found especially in slaughtering and meat-packing houses, crab and

peanut factories, and iron, steel, and automobile industries. They were also working in furniture and shoe factories, printing and publishing establishments, and in cotton and silk mills. They were semi-skilled workers in electrical supply, paper-box, and rubber factories, and in the textile industries.⁵⁰

But during World War I, they entered the northern industrial labor force for the first time. "A Women's Bureau survey of 11,812 female employees in 150 plants in nine states found that most of the women were young (sixteen to thirty years old), and they worked at a variety of jobs. In war industry plants, they assembled munitions and manufactured gas masks, airplane wings, nuts, bolts, rivets, screws, rubber tires, tubes, and shoes."⁵¹

While some believed it looked like a bright new employment future for African-American women, Jacqueline Jones points out that industrial employment during World War I provided only temporary progress. She sites three reasons for this.

The percentage of semiskilled operatives increased threefold from 1910 to 1920, but that gain represented only a small proportion (4.3 percent) of all black female workers engaged in non-agricultural pursuits immediately after the war. (A similar trend was evident among factory laborers.) Of the black women who did not till the soil in 1920, fully 80 percent were still maids, cooks, or washerwomen. Second, black women employed as industrial workers remained at the lowest rungs of the ladder in terms of wages and working conditions; for the most part they replaced white women who had advanced, also temporarily, to better positions. Finally, demobilization eroded even these modest gains. In October 1919 a writer for *World Outlook* acknowledged that [it] "was expediency [that] opened the door of industry" for black women, but that "in most cases, the colored woman is the 'marginal worker.' She is the last to be hired, the first to go." Those who managed to hold on to industrial jobs faced a constant struggle. As a New York woman remarked, "Over where I work in the dye factory, they expect more from a colored girl if she is to keep her job. They won't give a colored girl a break."⁵²

In Europe, women were also recruited into industry. "Working class women replaced youths or semi-skilled men in the metal trades. Sometimes a group of women did jobs which had been previously done by a smaller number of men."⁵³ Sheila Rowbotham notes

These changes were the result of the military needs of an imperialist war. The price for doing men's work was harsh indeed and it would be naive to see the work itself as emancipating for women workers. The integration of women into the labour force was accompanied by and in part as a result of labour and production speed-ups. All protective legislation was set aside, and women were exposed to dangerous and heavy trades, with disastrous effects on health.⁵⁴

In the two decades following WW I, Europe experienced major economic shifts due to the modernization of industry. During this time, hundreds of thousands of women left private service to enter manufacturing jobs. At the same time, the

proportion of women in the total manufacturing work force actually fell.

What this means is that economies industrialized and deployed their working populations differently from before, absorbing reduced proportions of women into industry. Yet, male workers complained continuously that women were taking away jobs. What was the trouble about?

The answer lies in an analysis of the changes within industrial work itself, for modernization meant not only more jobs but quite different jobs. An overview shows that the branches of manufacturing traditionally occupied by women declined more rapidly than the new areas that employed them expanded. Thus, textiles and clothing manufacture dropped off faster than metallurgy, chemicals and textiles picked up. At the same time, the newest industries organized ... by producing standardized parts on assembly lines timed for maximum productivity. The system created jobs for unskilled, patient, precise workers; the qualifications spelled "women." The women thus employed had to keep up with high-speed, often dangerous, mind-numbing work at barely subsistence wage levels, while men grew hostile at the "unfair" competition.⁵⁵

In postwar Germany, increasing numbers of women entered the growing chemical, electronics, paper, metallurgy and optic instruments industries. At the same time, the textile industry began to decline due to increased use of synthetic fibers. In the clothing, and food and beverage industries, "large-scale production sharply reduced the number of small female-directed businesses."⁵⁶ Similar patterns developed in France, where women lost work in clothing and textiles, but found work in tanning, metalworks, motor car manufacture, chemicals and papers, and electric apparatus manufacture. In France, too, the numbers of women entrepreneurs fell while the numbers of non-managerial office workers increased.

In the United States, similar shifts also occurred as industrialization continued, as did the rapid increase in office jobs for women. For African-American women,

Compared to work in domestic service and agriculture, manufacturing jobs would have been a great step forward, yet in the 1920s and 1930s the number of black women employed in industry was very small. The only jobs that black women could get in industry were menial or unskilled; the semiskilled and skilled jobs were reserved first for white men and then for white women. Black women (100,000 in 1930) were employed in the largest numbers in the tobacco, clothing, food, textile, lumber, iron and steel, and printing industries.⁵⁷

A Women's Bureau survey of census data showed that the number of women acting as foremen increased between 1910 and 1940, but the overall proportion remained constant just below 10 percent.⁵⁸ In 1940 about half the women foremen were in the textile and clothing industries, which was an increase over previous years. The numbers of women foremen in the metal and miscellaneous manufacturing industries had decreased.

The same study also noted that "throughout the 70-year period [1870 to 1940], the skilled work of the craftsman, with its long apprenticeship, frequently with its requirements of physical strength, and often with its restrictive union regulations, was not a field open to women on a very wide scale."⁵⁹

That pattern changed – briefly – with the advent of World War II. As in the first World War, the increased need for a skilled workforce in heavy industry, combined with a labor shortage, forced industry to begin hiring women. This did not happen overnight, nor did it happen without great reluctance on the part of employers. In 1940 at the end of the depression, unemployment was officially 19.1 percent, and was nearly double that for women and African-Americans. "But with war orders pouring in and thousands of men leaving for the front lines, business faced a severe labor shortage."⁶⁰

Eager to take advantage of the opportunities provided by war in Europe, and desperate after Pearl Harbor to replace men who had been drafted, employers nevertheless hired women only cautiously. In 1940 and 1941, they turned to the reservoir of unemployed men to fill available jobs. Not until 1942, and then pushed on by the Women's Bureau and organized women's groups, did employers attempt to fill many jobs with women. For a brief two-year period, women worked in shipyards, steel mills, and ammunition factories. They welded, dug ditches, and operated forklift trucks. And then they were ceremoniously let go.⁶¹

Part of the delay in bringing women into the work force was due to union policies. Although most CIO unions had admitted women before the war, a number of AFL unions had not.

Pressured by both the government and the women workers themselves, a number of these unions – the International Association of Machinists, the Molders and Foundry Workers, the Iron Shipbuilders and Helpers, the Ironworkers, and the Carpenters and Joiners – revised their admission policies after Pearl Harbor. The International Brotherhood of Boilermakers, the most intransigent of the AFL unions, refused to reverse its opposition to women members until the fall of 1942.

The Railroad Brotherhoods also proved to be among the most unyielding to pressures to abandon their opposition to women, but by the war's end not only had all AFL and CIO unions admitted women, but even the transportation brotherhoods had opened their doors at least a crack.⁶²

In Europe, as well, women were recruited into the work force. In the Soviet Union, "for example, in one year, 1941-1942, the percentage of women steam engine operators rose from 6 percent to 33 percent and similar dramatic increases occurred among tractor drivers, locomotive engineers, steam compressor operators, electricians, and welders – all highly paid occupations."⁶³

Although most women were laid off at the end of the war to make room for returning veterans, they did not want to go. Contrary to the stereotype of the young woman working for "pin money," most women who worked in the war industry had been employed prior to the war, and knew they would continue working after. "Seventy-five percent of those interviewed during the war years and the demobilization period overwhelmingly declared their desire to continue in their jobs.... They were also the women who, having worked at low-paying jobs before the war, were reluctant to return to them afterwards."⁶⁴

Shortly after the war, women who had been retired from war jobs re-entered the work force. "Women gave up jobs entirely in heavy industry, and with a few exceptions their numbers returned to the prewar level in most manufacturing industries.... Opportunities in office work bounded upward...." ⁶⁵

From the mid-1940s through the 1970s, women continued to be excluded from most skilled trades jobs. After the 1964 Civil Rights Act outlawed discrimination on the basis of race and sex, minority men began using the law to "sue construction trade unions, contractors, and police and fire departments for discrimination."⁶⁶ Electrician Molly Martin noted

By the early seventies, women also began to demand access to blue-collar jobs. We formed organizations to pressure lawmakers to include women in civil rights legislation and to enforce affirmative action laws. We sat in at contractor's offices and stood in line at union halls. We picketed, petitioned and wrote letters, and we pounded the pavement looking for construction jobs.⁶⁷

Two federal regulations concerning affirmative action and apprenticeship took effect in 1978. The first, Executive Order 11246, amended the 1964 Civil Rights Act, and set goals and timetables concerning the hiring of women in construction on federally-funded projects. The second was Department of Labor apprenticeship regulations that also set goals for women apprentices. Writing ten years after these regulations took effect, Martin said, "Today, in 1988, the barriers have not been completely broken, but women at least have a foot in the door. Despite our gains, however, occupational segregation is still firmly entrenched.... Women represent only about eight percent of all precision production, craft and repair workers."⁶⁸

Women have demonstrated that they are capable of skilled work in virtually every trade. Indeed, there is no trade in the United States today that does not have women workers, even though their numbers may sometimes be small. By the same token, there are few trades, if any, that have not benefited from women's participation and inventive

genius. The following sections will discuss in more detail women's contributions to the trades and industry.

- ¹ Ethlie Ann Vare and Greg Ptacek, *Mothers of Invention: From the Bra to the Bomb: Forgotten Women and Their Unforgettable Ideas* (New York: Quill/William Morrow, 1987), 22.
- ² Patricia Monaghan, *The Book of Goddess and Heroines* (New York: E.P. Dutton, 1981), 74.
- ³ Margaret Ehrenberg, *Women in Prehistory* (Norman: University of Oklahoma Press, 1989), 46.
- ⁴ Ehrenberg, 57.
- ⁵ Ehrenberg, 57.
- ⁶ Ehrenberg, 83.
- ⁷ Ehrenberg, 48.
- ⁸ Ehrenberg, 50.
- ⁹ Bonnie S. Anderson and Judith P. Zinsser, *A History of Their Own: Women in Europe from Prehistory to the Present*, Vol. 1 (New York: Harper & Row, 1988), 409.
- ¹⁰ Frances and Joseph Gies, *Cathedral, Forge, and Waterwheel: Technology and Invention in the Middle Ages* (New York: Harper Collins, 1994). This book addresses the subject in detail.
- ¹¹ Gies, *Cathedral, Forge, & Waterwheel*, 125.
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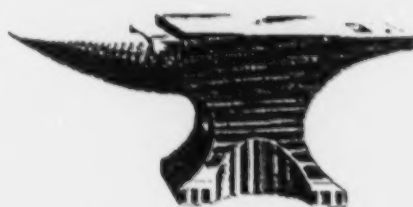
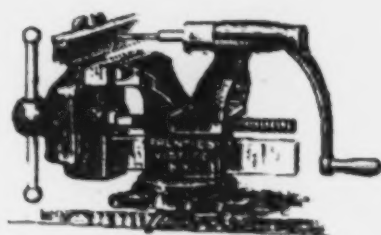
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Metal Products and Heavy Industry

Ancient Greece

References to women in metal working trades have been found in ruins from ancient Greece. In one case dating from the 2nd or 3rd century, a woman and her husband had apparently incurred the wrath of a vindictive person. Both were named on a leaden curse tablet. The curse reads "Dionysius the helmet maker and his wife Artemis the gilder (their household and workshop and work and livelihood)..."¹ While most poor women worked in domestic jobs in Greece, a few worked in family trades such as gilder and helmet maker.²

Europe, 1300 - 1900

From the late Middle Ages through the Industrial Revolution and well into the modern period, there are many records of women involved in a wide variety of metal working trades. In Cologne, Germany, in the late fourteenth century, women are listed on guild rolls as needle makers and smiths. Some of these women were in business in their own right, others as widows.³ Other widows were listed as pewterers, copper beaters, and blacksmiths, but the guilds forbade widows to continue their husbands' work of bronze casting and sword making.⁴

In mid-fifteenth century Strasbourg, women were listed on guild rolls as blacksmiths and goldsmiths;⁵ "in early modern Geneva, they did skilled metalwork in their own shops."⁶ In other cities, women also worked as jewelers,⁷ gilders, and ironmongers.⁸ In most cases, these women were widows carrying on the husband's business. According to Merry Wiesner, "the few who were not were clearly exceptions, although it is interesting to discover that there were women who ran foundries, shod horses, shipped sheet metal, and made armor."⁹

Next to the textile and clothing industry, light metal work was the trade category that offered the most opportunities for women in many medieval cities.

In every city there were always a few women operating independently making needles, rings, measures, thimbles, and other small articles out of iron and tin. In some cities these were "free arts," and so women were not challenged in what they did. Only if they tried to make keys and locks or something which required a similar amount of training and was thus regulated by a guild did they come into conflict with male artisans. Even in cities where all these small metal items were supposed to be made by certain guilds, needle and pin making were seen as an appropriate female task, and women were usually allowed to work on their own at it. It required few tools and nimble hands, the right kind of job for women who for some reason "can not spin or sew," the usual female occupation. If a

woman tried to use her husband to help her, however, she was sharply rebuked, for then this was *Handwercksstimpeln* (dabbling in a craft one had no authority to work in).¹⁰

Wiesner also notes that married couples often worked together as piecework thimble makers in a master's shop.¹¹

Women in sixteenth century France often worked as pin makers on their own, with a husband, or as a widow. Two successful widows were "Dame Ysabeau de Seure [who] worked with her son, but was also able to hire a journeyman in 1565, while the next year Jehanne Tutilly was buying 170 *livres* of brass wire for her pins from German merchants."¹²

Light metal manufacturing became more industrialized in England during the eighteenth- and nineteenth-centuries. Pin making was the largest industry in Gloucester, employing nearly 400 people, including many women and children."¹³ The pin making industry near Bristol

employed a great number of girls; who with little machines, worked by their feet, point and head them with great expedition; and will each do a pound and a half in a day. The heads are spun by a woman with a wheel, much like a common spinning wheel, and then separated from one another by a man, with another little machine like a pair of shears.¹⁴

Many light metal industries were clustered around Birmingham in the mid-19th century. Over 97 different trades were listed by a government commissioner, including the manufacture of locks, nails, nuts, bolts, screws, buckets, bits and stirrups.¹⁵ Men, women, and children did the work primarily in their homes.

In one region, girls as young as seven or ten years old were often apprenticed, and remained indentured until they were 21 or married. Usually they were trained in "nail-making – including nuts, bolts and rivets – set-making, chape filing, screw making, and bit and stirrup making."¹⁶

The numbers and proportion of women employed in these trades increased in the early nineteenth century due to the introduction of new machines. One government report stated in 1843, "In many of the manufacturing processes carried in the Birmingham district, girls are employed equally with boys, and the system has lately become prevalent of substituting in many branches the labour of women for men." Women were the great majority of workers in screw manufacturing and in the button industry as well.¹⁷

Other metal workers included two women listed in the workhouse records for Bristol, England in 1787. Sarah Lewis had been paid for plating, and Susannah White for pumps she had manufactured.¹⁸

Women were also employed in heavy metal industries. "In the iron trade prior to the Industrial Revolution, workers in the early forges were often assisted by their wives, who did odd jobs, such as breaking the ore, attending the bellows and general labour about the forge."¹⁹ The developments of the Industrial Revolution, and the labor shortage that accompanied it, led to the employment of women and children in greater numbers than previously. In 1842, 1,565 women were reported to be employed in metal

manufactories, approximately one for every 18 men in the industry. At the same time, 1,062 girls were employed (the proportion was 1:3 with boys), and 261 of those girls were under the age of 13. Those who worked as laborers in the ironyards

were engaged in preparing the ore, wheeling it to the furnaces, filling them with iron and limestone, making coke and carrying it to the refiners, and removing cinders from the furnaces. Breaking limestone, which was used as a flux for the ironstone, was left entirely to women, and the "pilers" also, employed in one of the processes of manufacturing bar iron, were principally women and girls. A good deal of this general labouring was heavy work, and while it was done for the most part in the open air and under fairly healthy conditions, the hours of the labour were such as frequently caused severe physical strain. As the furnaces were always kept in blast, the work was continuous, and many of the men, women and children worked alternate of seven days or nights for twelve hours on end, frequently spending the whole twenty-four hours in labour at the change-over. The absence of any one day for rest was felt most severely by the women limestone breakers whose daily task of breaking from ten to fourteen tons of limestone required incessant effort to keep the furnaces supplied.²⁰

Women also worked in the copper foundries, where they labored all day breaking up large pieces of coal for use in the furnaces;²¹ in the tin plate industry, where they worked as assistants; and in the finishing processes, "some of which required a considerable amount of experience and skill."²²

In some regions of England, women also worked at blacksmiths' forges as nail makers. In 1842 women nail makers far outnumbered the men in the region of Sedgely. In fact, one contemporary observer commented, "Sedgely might appropriately be termed the district of female blacksmiths. They are its most prominent characteristic."²³ Pinchbeck goes on to state that women had been established in the trade for nearly 150 years. In fact, a list of smiths working in Chester in 1574 included 5 women and 35 men. Another observer described their work:

The girl with one hand works the big blastbellows which are hung behind, and with the other pokes a long rod of iron, like a big skewer of three feet, into the cinders. Then she takes the rod out, drives the red end into a hole in a small anvil, snips it off above, hammers the top down into a head, and turns it out into her heap. All in a few seconds.... They ... work from 6 a.m. to 9 p.m. and often longer....²⁴

Goldsmithing was a trade that included relatively large numbers of women. An early record of a woman goldsmith refers to Drutgin van Caster, who in 1500 became an artisan for the Holy Roman Emperor Maximilian.²⁵ What makes goldsmithing particularly interesting among the metal trades is that women goldsmiths continued to work in the trade on an equal basis with men, even after women had been excluded from

many other skilled trades. There are no clear indicators as to why women continued to be active in this trade. "What can be stated definitely, however, is that women played a pervasive role in the goldsmiths' trade from its inception. As the records of the industry and other documentary sources attest, women participated at nearly every level of the business, from retailer to rouger, shop manager to apprentice."²⁶ In England, the Goldsmiths' Company "differed from other guilds in requiring that masters teach their apprentices to read and write, a valuable addition to the normal craft skills."²⁷

The term goldsmith covered a wide variety of activities: it referred to the highly skilled metal worker as well as the shop manager and retailer. Silversmiths also fell under the term "goldsmith." Goldsmithing, like many other trades, was often a family business, and women worked in the family trade. The most prominent goldsmithing families in England were quite wealthy and moved in upper-class circles. Louisa Courtauld was a prominent member of one of the most famous families of English goldsmiths. She began in partnership with her husband Samuel in 1749, and continued after his death with several other partners, until she died in 1807.

Well into the mid-18th century, the regulations of the Goldsmiths' Company made frequent references to women who worked in their husbands' shops. "An early regulation of 1399 referring to women arose from the need to protect the secrets of the craft; it was required that no member of the company should give any goldsmiths' work to a woman who was married to a member of another trade."²⁸ This certainly encouraged women from goldsmithing families to marry within the trade.

Many women goldsmiths are known because they were required to register their marks with the guild. The guild chapters kept detailed records, most of which still survive. Women learned the trade as apprentices, or as the assistants of their father or husband. When they worked with a husband, their work usually was produced with his mark. It was not until they became widows that they registered their own marks; afterward they "were treated like male goldsmiths in every respect."²⁹ If they remarried another goldsmith, they might continue under the new husband's mark, although some registered new marks indicating a joint business. "A long and active widowhood may have been more common among the women goldsmiths outside London, where there were fewer goldsmiths from whom they could choose a second husband to create a stronger trade partnership."³⁰

One such woman was Jane Terry Williams whose father, Carden Terry was a goldsmith. When she married John Williams in 1791, he became business partners with her father. After John died in 1806, Jane registered her own mark in Dublin, and became her father's partner the following year. She continued to work actively in the trade for 14 years.³¹ Others were Elizabeth Hayward of Salisbury, who continued her husband's business after his death in 1729, and was still active twenty-one years later; Mary Roberts of Bristol who was active from 1679 to 1715, and Mary Ashe of Launceston who carried on the family business from 1689 until her death in 1722.³²

One specialty within the trade that was considered particularly appropriate for women was goldspinning, which was made a sworn craft in 1597 in Germany with a four-year apprenticeship.³³ Other specialties within the trade included many kinds of small work, such as the manufacture of buckles, gold and silver buttons, spurs, flatware, wine labels, and fancy goods and novelties; also engraving, silver flatting (producing sheet silver

from ingots), burnishing, and rouging. Many of the workers in these specialties worked in small shops or at home, and were paid by piecework. They often sold their goods to major manufacturers and retailers like Louisa Courtauld or Rebecca Emes, who sold the goods under their own marks.

Elizabeth Pantin Godfrey
Goldsmith
England
Active: 1731 - 1758

"Elizabeth Pantin, daughter of the distinguished Huguenot silversmith Simon Pantin, married twice, both times to active goldsmiths. Her first husband, Abraham Buteux, was from the French immigrant community. Her second husband was Benjamin Godfrey. The business dealings of her father and successive husbands indicate that they were supplying the nobility with high-quality silverware, often with a strong French flavor. She had two periods of independent activity in widowhood, the second when the rococo style was sweeping through the decorative arts in England and forcing artisans to adopt new styles. The clientele of the business she ran remained loyal, providing evidence of her ability to manage a business and respond to the prevailing fashions in silver. That Elizabeth Godfrey's clients included a royal duke, earls, minor nobility, and others of discrimination and wealth is suggested by the heraldic images incorporated on one of her trade cards. She undoubtedly takes the crown as the outstanding woman goldsmith of the 18th century."³⁴

Ann Jaquin
Goldsmith
England
Active: 18th century

A woman goldsmith who probably belonged to a lower social class than the better-known women who were daughters of goldsmiths and later registered marks themselves, Ann Jaquin was made an apprentice in 1723, and apparently never married. She worked as an employee in a master's shop, until she took her freedom (i.e., became a master in her own right) in 1746. It may have been that the workshop master had died or moved on, and she needed the right to take apprentices.³⁵

She took on a female apprentice, Elizabeth Bence, a year later. Elizabeth's apprenticeship was entered on the rolls:

Memorandum, That I Elizabeth Bence, Daur. of Peter Bence, late of the Parish of St. Hames, Westmr, in the County of Middlesex Chocolate

Maker deced. Do put myself Apprentice to Ann Jaquin. Citizen and Goldsmith of London for the Term of Seven Years from this Day there being paid to my said Mistress Thirty Pounds.

Elizabeth Bence³⁶

Rebecca Emes

Goldsmith: Plateworker

England

Active: 1808 - 1829

Rebecca Emes was one of the leading business owners in England in the early 19th century. After the death of her husband in 1808, she registered her mark, first with William Emes, who may have been her brother-in-law, then with Edward Barnard. The partnership of Emes and Barnard ran one of the largest silver workshops of the period.³⁷

The responsibility of both Rebecca Emes and Edward Barnard in their enterprise was: to employ good draftsmen, chasers, molders, and engravers; to negotiate with the retailers who were their clients; and to maintain their extensive provincial and overseas network. Their ledgers show they shipped goods up to York where they were overstruck with the mark of a local York retailer, to Exeter, to Ireland, and to India, for sale in Calcutta. The world of Rebecca Emes ... was that of the leading business owners in England, who dealt personally with retailers, as well as with their royal and noble clients.³⁸

The United States and Canada, 1600 - 1900

European colonists continued the guild and apprenticeship system they had known in England and other European countries, but the chronic shortage of skilled labor and the wide dispersal of settlements with few urban centers made it easier for some women to learn the metal trades. Some women blacksmiths, silversmiths, and gunsmiths appear to have served regular apprenticeships; others learned from their fathers and husbands. A number of widows continued their husband's businesses. For example, in 1754 widow Mary Salmon of Boston announced that she would "carry on the business of horse-shoeing, as heretofore, where all gentlemen may have their Horses shod in the best Manner, and also all sorts of Blacksmith's Work done with Fidelity and Dispatch."³⁹ Another blacksmith's widow, Jane Burgess of Maryland, announced in 1773, "I still carry on the Blacksmith Business, and shall be obliged to my Friends for the continuance of their Favours."⁴⁰ Other widows advertised their foundry work. A few owned forges. There were a number of women gunsmiths.⁴¹

One source cites of a list of women in the Southern colonies who worked in diverse trades in the 18th century. These include Jane Inch, silversmith; Mary Willet, pewterer; Anna Maria Hoyland, braziers and tinwork (as her mother before her); Jane Massey, gunsmith; and Mary Butler, block maker (for ships) and pumpmaker.⁴²

Mrs. S. Pencill of Charleston, South Carolina, placed an ad in 1797, asking her late husband's friends "both in Town and Country for a continuance of their favors in the TIN PLATE-WORK; being determined to use every exertion to give satisfaction and meet their approbation."⁴³ And Mary Jackson, a Boston tinker advertised that she could make "Tea Kettles and coffee pots, copper Drinking Pots, Brass and copper Sauce-Pans, stew-pans, Baking-pans, Kettle-pots and Fish-Kettles."⁴⁴

The numbers of women involved in metal industries increased in the last half of the nineteenth century. In 1850, they had constituted 3.4 percent of the metal industries work force; in 1905 they made up 14.2 percent.⁴⁵ The major branches of the industry employing women were jewelry manufacturing, in which women increased from 7.4 percent to 30.6 percent in that time period; watch making, increasing from 14.8 percent to 50.5 percent; and in clock making, increasing from 2.0 percent to 22.7 percent.⁴⁶ Women also found increased employment in the tin-plate industry, where they separated the sheets after the pickling process. Called "openers", they "wore heavy gloves with a heavy lead piece in the palm, with which they took hold of a sheet of welded plates, beat it on the ground to separate the parts, and then made an opening. Forcibly tearing the plates apart, they held part of the sheet down with one knee while they tore the metal with the other."⁴⁷

Beyond those three industries, Helen Sumner notes that in the metal manufacturing industries, "the work of women has generally been polishing, filing, soldering, tending the lighter forms of machinery, and weighing and packing the lighter articles."⁴⁸ She attributes the increased employment of women to the introduction of new machinery that broke the manufacturing process into smaller divisions, and which could be operated by unskilled labor.

In 1868 women burnishers in New York City formed the Brooklyn Female Burnishers' Association, led by Maggie McNamara. An unusual pattern developed in the burnishing trade at that time. One labor editor wrote, "It has always been understood that women were employed in factories because their labor was so much cheaper than men's, but this order of things is reversed in the burnishing trade, where the women earn more than men."⁴⁹ Maggie McNamara protested that male burnishers were undercutting the union's price scale, which was accepted by employers as the standard.

A "new branch of trade" was opened to women in the 1860s with the employment of women as operators of light machines, grinding drills, and files. Twenty-four women were employed in these positions at the Morse Twist Drill and Machine Company of New Bedford, Massachusetts in 1867. The women worked in a department by themselves. Three years later, in an address to Sorosis, one woman stated that "in the soldering of tubes for steam engines and the like there is great scope for female labor, and young girls are employed to bind the tubes with wire preparatory to soldering. This is not very hard work and is very remunerative."⁵⁰

Mass production methods were first used in arms manufacture about 1820, and were soon introduced in the watch and clock industry. The result was the loss of jobs for

skilled watch makers, and an increase in women employed in unskilled and semi-skilled positions. In the 1850s, watch and clock making was seen as employment well-suited to women. In 1860, women constituted 14.8 percent of all watch making laborers; they increased to 36.4 percent by 1880.⁵¹ The Elgin Watch Factory, founded in 1867, employed large numbers of women: half of its 250 workers were women.

In the South during the first half of the 19th century, African-American women slaves labored in foundries, loading ore into crushers and furnaces.⁵² And in the West, women did a variety of metal work. Anne Patrick was a gunsmith in the 1830s, and other women worked as blacksmiths. One Montana editor wrote, "When feminines turn Vulcanists and bronco-shoers the worser half will get their just deserts."⁵³

Canadian women were somewhat less well represented in the metal industries, as recorded in the census of 1871. Only six companies in the primary metals sector, such as the Montreal Type Foundry which had 15 women and 10 girls engaged in making printer's type materials, reported female workers. Thirty metal fabricating or machinery businesses such as the Canada Screw Company and Eastwood & Co's agricultural implement factory, reported women workers.⁵⁴ The Widow Charles Terreau, owner of Fonderie de la Canotterie in Quebec, which produced stoves and kettles and employed 10 men, "was one of 10 women named as a proprietor of a metal products business."⁵⁵

The 19th century saw a great boom in inventive creativity, and women were well-represented in the invention of metal products and industrial machinery. Matilda Joslyn Gage, in her 19th century essay "Woman as Inventor," listed significant inventions by women including

a volcanic furnace for smelting ore... a screw-crank for steamships... syllable type with adjustable cases and apparatus; machine for trimming pamphlets ... bag-folding machine.... Many improvements in sewing machines have been made by women; as a device for sewing sails and heavy cloth; quilting attachments; the magic ruffler; threading a machine when upon a full run (an idea scouted by male machinists); an adaptation of machines for sewing leather, etc. This last was the invention of a practical woman machinist, who for many years carried on a large harness manufactory in New York City.⁵⁶

Gage also mentioned that "the Burden horse-shoe machine, turning out a complete shoe every three seconds, was a woman's invention. At a renewal of the patent, in 1871, it was claimed that thirty-two million dollars had been saved to the public during the fourteen years of its use."⁵⁷

Harriet R. Tracy patented a number of inventions including a folding adjustable stove for cooking, a fire escape, an elevator and safety devices for elevators, and a number of sewing machine improvements.⁵⁸ Mary Evard patented an improved design for a wood cook stove, which she manufactured and sold as the "Reliance Cook Stove." In demonstrations, she showed "that it could simultaneously cook three pounds of lamb, a spring chicken, soup, coffee, several varieties of vegetables, and a small pound cake."⁵⁹ The stove was enormously popular, and her company could barely keep up with orders.

They soon went out of business due to increased competition from a similar design and lack of capital.

Other prominent women inventors of the 19th century were Margaret Knight, Helen Augusta Blanchard, and Mary Carpenter Hooper.

Mary Carpenter Hooper
Inventor of Industrial Machinery
United States
patents awarded 1870 - 1891

"Mary Carpenter (later, Hooper) made her mark primarily in industrial machinery. *Scientific American* assigned prime position and illustration space to news of her self-threading and self-setting sewing machine needles, which displayed 'a great deal of ingenuity and inventive capacity' since the operator could thread them easily and their increased elasticity made constant readjustment unnecessary. The magazine reported that in an experiment on the heaviest kind of shoes, a Hooper needle stitched sixty pairs in a single day without breakage or inconvenience.... A week later, in an article on women inventors, the lofty periodical bestowed what it must have considered ultimate kudos on her invention: '[It] would not do discredit to the most experienced and ingenious male inventor.'

"Carpenter also patented such diverse devices as an ironing and fluting machine, an improved mop wringer, a sewing machine needle and arm, an improvement in sewing machine feeding mechanisms, a button, a grated shovel, a 'device for numbering houses,' and a 'netting canopy for beds.' Another Carpenter machine, smaller than a typewriter, braided and then sewed straw, making it possible to convert from expensive and intricate hatmaking into a smooth process of sewing the hat from crown tip to outer edge in one continuous motion without removing it from the machine. According to *Inventive Age*, an important late-nineteenth-century 'invention magazine' edited by Robert DuBois... it so revolutionized the industry within two decades of its patenting that 'not an inch of straw braid sewn into hats by machine anywhere in the world does not employ a part of Mrs. Hooper's invention to accomplish the work.' The fact that her invention was in a field 'into which women always venture at a risk of being suspected of scant knowledge and less experience - mechanics' impressed the editors even more."⁶⁰

Helen Augusta Blanchard
Inventor of Industrial Machinery
United States
1840 - 1922

With 28 patents to her name, Helen Blanchard was one of the most prolific female inventors of the 19th century. Between 1873 and 1901, she often received a patent every year. She registered twelve patents for various types of sewing machines: the Blanchard over-seaming machine (precursor of the modern zigzag sewing machine), a device for simultaneous sewing and trimming of knitted fabrics, and a crocheting and sewing machine. Her inventions were used in large textile factories and were ranked among the most remarkable mechanical devices of the age. Blanchard became wealthy from her inventions, and used her money to assist other women.⁶¹

Blanchard was born in Portland, Maine in 1840, the daughter of Nathaniel Blanchard, Portland's best known shipbuilder and owner of packet steamers. He was a prominent businessman until his business collapsed in the financial panic of 1866. After his death, his daughter Helen was destitute and forced to find a way to support herself. Using her mechanical aptitude, she turned to inventing industrial machinery, and made her own fortune. She was able to buy back the family homestead, which her father had been forced to sell. Frances Willard included Blanchard in her biographies of important 19th-century women.⁶²

Margaret E. Knight
Inventor of Industrial Machinery
United States
1838-1914

Margaret Knight received 28 patents, almost all in the field of industrial machinery, and also invented a number of devices that were never patented. She was born into a working class family and although she received little formal education, she showed mechanical aptitude at an early age. Much later, when asked "how an uneducated woman with no training in mechanics" could invent industrial machines, she replied:

As a child, I never cared for things that girls usually do: dolls never possessed any charms for me. I couldn't see the sense in coddling bits of porcelain with senseless faces: the only things I wanted were a jack-knife, a gimlet, and pieces of wood. My friends were horrified. I was called a tomboy; but that made little impression on me. I sighed sometimes,

because I was not like other girls; but wisely concluded that I couldn't help it, and sought further consolation from my tools. I was always making things for my brothers: did they want for anything in the line of playthings, they always said, "Mattie will make them for us." I was famous for my kites; and my sleds were the envy and admiration of all the boys in town. I'm not surprised at what I've done. I'm only sorry that I couldn't have had as good a chance as a boy, and have been put to my trade regularly.⁶³

Instead, Knight worked at a variety of factory jobs, beginning in a cotton mill when she was nine or ten. Her first known invention was at age twelve, when she observed an accident in which a steel-tipped shuttle injured a textile worker. On the spot, Knight designed a stop-motion device that would prevent further such accidents. Although widely used, the device was never patented.⁶⁴

Knight's best-known invention was a machine that folded and glued flat-bottomed paper bags. She first developed the idea while employed in a paper-bag factory, and spent two years perfecting the idea. "After making thousands of trial bags on a wooden model, she commissioned a Boston machinist to produce an iron model for patenting purposes. But before she could apply for the patent, she learned that a man who had studied her model of the machine while at the machinist's on other pretexts had subsequently patented a machine suspiciously like hers."⁶⁵ Knight filed a patent interference suit, and won, although she had to prove that a mere woman with no technical training was capable of inventing such a machine.

She and a partner established the Easter Paper Bag Company of Hartford, Connecticut, and she received royalties on every bag produced for years. "Knight was able to enjoy her success during her lifetime, for her machine attracted extraordinary attention when it first appeared, both in Europe and America, and even the news that the machine could do the work of thirty persons alarmed no one. Such progress, after all, was in the 'spirit of America.' "⁶⁶

After the turn of the century, Knight began working in the fast-growing field of automotive engineering, receiving patents for valves, rotors, and engines.⁶⁷ She continued to work daily in her experiment rooms in Boston until her death in 1914.⁶⁸ Knight was often cited as a role model for other women inventors.⁶⁹

Twentieth Century

Women's work in the metal industries prior to the first World War followed in the patterns of the previous century. They worked in tin-plate mills, did light machining in the production of bolts and screws, and braided and twisted cable in cabling companies. Less than five percent of the women in metal industries worked in iron and steel production; the majority were found in the manufacture of numerous small metal articles such as tin cans, enameled ware, wire, cutlery and hardware.⁷⁰ In addition, they "entered the burgeoning electrical industry, doing not only routine work, such as winding coils but

also heavy work such as splitting mica."⁷¹ They also entered the new automobile manufacturing industry.

African-American women were employed in small numbers as unskilled workers in the iron, steel, and automobile industries. A few were skilled tinsmiths and coppersmiths.⁷²

Some of the first protective legislation in the United States concerned women who worked as iron molders. Women began working in iron foundry core rooms in 1884, making "core" from which molds were taken. Initially, their numbers were few, but "they had increased steadily in number since 1903 when plant consolidations made their use profitable."⁷³ These jobs required considerable skill, and involved a two-year apprenticeship. Government inspector Elizabeth Butler found in 1907 that nearly a fourth of Pittsburgh's core makers were women. "She found the men in the industry fearful that women were undercutting their jobs, yet unwilling to admit women into their union and to permit women to work in the same plants with men. Thus in the core room of the largest foundry in Pittsburgh, all fifty of the workers were women."⁷⁴

In the same year, the union decided to eliminate women from the core rooms. Claiming that the work, dirty and heavy, was injurious to women, and that women's low labor standards endangered men's higher standards, they instituted a fine of \$50 for union members who instructed women.

Then in 1910, the iron molders in New York appealed to the state legislature for a law prohibiting women in the trade, claiming the work was unhealthy for women. An investigating commission found that the conditions in core rooms were in fact injurious to both men and women, the noxious fumes and inadequate ventilation causing rheumatism, kidney trouble, and lung disease. But the commission commented that women should never have been employed in core making, and recommended that their employment be discouraged. They stopped short of recommending that women be eliminated from the trade entirely, recognizing the hardships that would be created by putting 300 women out of work.

The bill that emerged from the legislature prohibited women from working in the same rooms as men and forbade them altogether from core rooms where the ovens that emitted fumes were located in the working space. It also regulated the size and weight of cores women could handle. The result, in the words of a union official, was "practically to exclude women from the foundry."⁷⁵

As in previous centuries a few women chose to assume male identities, usually for the greater opportunities open to them in employment. In 1909 in St. Louis, there was a report of a young woman aged 22 who had passed as a man since she was 13. She had pursued a variety of occupations, working in a livery stable, in a plough factory, and as a furniture maker. "At one time she became a boilermaker's apprentice, wielding a hammer and driving hot rivets. Here she was very popular and became local secretary of the International Brotherhood of Boilermakers."⁷⁶ This is particularly interesting in light of the fact that the International Brotherhood of Boilermakers was one of the most recalcitrant unions regarding the admission of women members during World War II.

The twentieth century saw women's work opportunities expand in response to the needs of war. During the Mexican Revolution in 1910, "the Narváez sisters, Guadalupe and Rosa y María, established a center in support of *maderismo* in Puebla. For many years they coordinated an operation that manufactured and distributed arms to revolutionary forces through intricate channels for contraband."⁷⁷

While the image of "Rosie the Riveter" is well-known from World War II, the "Rosies" of World War I are not as well known. Millions of American, Canadian, and European women entered the workforce for the first time. In England, working class women took unskilled and semi-skilled jobs in the metal industries.⁷⁸ In the United States, nearly three million women had entered the food, textile, and war industries by the end of 1918.⁷⁹ African-American women and men entered the industrial workforce in the northern states for the first time. Most of these African-American women were young, between 16 and 30 years old, and their jobs in the war industries included assembling munitions and manufacturing gas masks, airplane wings, nuts, bolts, rivets, and screws.⁸⁰ The work was hard and the working condition were not always good. In England and elsewhere, protective legislation was set aside and production was speeded up, with "disastrous effects on health."⁸¹

Throughout Canada, an estimated 35,000 women worked in the munitions industry. This is remarkable considering that prior to October, 1916, "no woman had been employed in a metal factory in Canada."⁸² The Department of Labor worked vigorously to address the concerns of both employers and employees as women were introduced into munitions work. At first, it was generally assumed that women could do only light machining, but

Contrary to expectation, all the imaginary objections were removed. Not only were women able to machine light components of fuses and similar warlike stores, but... machined the largest shells made in Canada. The 9.2 inch shells made by the Canada Cement Co., under the able direction of Mr. F. P. Jones, were fabricated entirely by women from the forging to the shipping stage. In less than five weeks from the day Mr. Jones started manufacturing 9.2 inch shells 400 women were successfully employed in this work.⁸³

One of the first studies of women's industrial work in the first World War was conducted by Enid Price as a college thesis and published in 1919. She stated

It is the purpose of this thesis to set forth the results of a personal investigation into the changes, brought about by the war, in the industrial activity of Montreal. It is a matter of common knowledge that the war industries were partly maintained by the labor of women. What is not known, however, is to what a great extent women have entered employments which had previously been reserved almost exclusively for men.⁸⁴

Much of Price's study focused on eight munitions plants. Several of these plants had been engaged in other types of manufacturing prior to the war and were converted to munitions production; a few were built specifically for munitions. In the first years of the war, munitions plants hired men almost exclusively, but by 1916 most had reached their peak production and were forced by labor shortages to hire women. The high point of employment was in 1917 when the eight plants employed a total of 9,931 men and 5,460 women. Some plants began laying off women in the latter half of 1917. Price states "over all, in 1917, women constituted 35 percent of the workers; the percentage fell to 22 percent in 1918."⁸⁵

One of the munitions plants in Price's study had produced electrical appliances prior to conversion. Price noted

This factory has always used women to a great extent. The employers have found them so satisfactory during an experience of twenty-five years that their policy is to use women in every capacity possible. During the war period this principle was followed although to a greater degree because of the existing conditions. Just previous to the signing of the armistice there were about 700 women and 700 men at work in the shops.... When shell production was begun in the plant men were used exclusively as operators and inspectors. After a while the company, always on the watch for new occupations for women, put them on inspection work. At a later date women assumed positions as operators. Thus women entirely supplanted men in the manufacture of munitions.⁸⁶

At the beginning of the war, all the government inspectors in the plants were men. Later, due to labor shortages and because women would work for lower wages, women entered inspection work in large numbers, ranging from 33 1/3 percent to 83 percent of the inspectors in various plants.

One plant in Price's study began hiring women in July 1918, putting them into the same positions at the same rate of pay as men. It was noted that women often worked faster and maintained better quality of workmanship. "This was remarkable for such work had hitherto been considered not only too heavy but too technical for a woman."⁸⁷

Lizzie Dickelman
Inventor, Sheet metal
United States
Patent Dates: 1917-1922

Lizzie Dickelman, the oldest of nine children, grew up in Forest, Ohio. With only a high school diploma, Lizzie took over her father's sheet metal business when he died in 1917. That year she received four patents for grain storage buildings and a corn crib. This was during World War I, and President Herbert Hoover was encouraging farmers to

find ways to preserve their crops. In 1920, Lizzie patented a ventilated storage warehouse which was perforated from the inside to allow air to flow through while keeping rain out, and two other grain storage buildings. In 1922 she added a patent for a grain bin door and door frame.

Lizzie didn't just rest on her patents. She manufactured the products in her sheet metal company and successfully marketed them in every state and many foreign countries. One observer said of her: "To invent a device is one thing but successfully to place it upon the market is another. Lizzie H. Dickelman has been able to do both and her product finds its market among the men."⁸⁸

World War II brought a new labor shortage, and many women entered the war industries in great numbers from 1942 through 1944. To study the dynamics of the labor force during this period, Kathryn Archibald took a job in a shipyard. She published her study as *Wartime Shipyard: A Study in Social Disunity*. Her experience and observations about women in the shipyard are typical of what happened in other industries at the time.

Before the war, most heavy industries, especially ship construction, had provided one of the few occupational areas upon which the pressure of feminism had been exerted in vain. They were protected by the comfortable conviction that the work was so complex and arduous as to remain forever beyond the weaker grasp of womankind. And then December 7th struck and the needs of war became paramount over all conviction. A typical pattern was established at Moore Dry Dock. Here, women were beginning to intrude into the actual work of construction by the late spring of 1942, first as welders, then as laborers and electricians, and finally, in a growing stream, into almost all the crafts of shipbuilding.

Men were amazed. Groups would gather about a lone girl welder and stare at her and her handiwork as at a circus freak. For their work at welding plates, the women were put first in open sheds "where everybody could keep an eye on them." Not until the fall were they permitted on the hulls as workers, and even then they were stationed only on the top deck. But as astonishment lessened and an occasional whistle took the place of the gawking stare, the limitations upon the usefulness of women were more and more withdrawn, and by the spring of 1943 women had obviously become a stable and inevitable factor in the economy of the wartime shipyard. By summer, the period of peak employment, women comprised approximately twenty per cent of the total working force of more than thirty-five thousand, and that percentage was maintained into the late months of 1944.⁸⁹

Despite their own reluctance and inadequacy, despite the derision which surrounded them and which their own attitudes helped to maintain, thousands of women came, remained for a year, for two years, and began to disappear only when the pressing need for them had passed. Among

them, moreover, were some who gave lie to tradition. Two women electricians, after months of attentive apprenticeship, were made responsible for installing the wiring in an electrically operated steering gear upon which the very function of the ship must depend. A girl pipefitter wept with chagrin when a leak was discovered in the piping she had installed. With some hesitancy men admitted the efficiency of these and other women like them, and gave them grudging praise for work well done. One foreman confessed that a few of his women workers were superior to the average run of men. "These women feel that they have to be better than the men," he explained, "because they know they're on trial in the shipyards, and so far as I'm concerned they sure have passed the test." I chanced upon several fairminded men who as the result of personal experience had come to believe that women had a permanent place in certain phases of heavy industry; that their work as electricians, for instance, was good enough to assure them equal consideration with men in a free field of competition. "There's some work around the yards women haven't got the strength to do," said one judicious observer, "but there's a lot of other things they can do just as well as men. Women make good electricians, good sheet-metal workers, and in the machine shop they handle some of the smaller lathes all right."⁹⁰

Some unions were slow to admit women. But as Archibald observed, they had little choice.

Normally, of course, women were excluded from the official channels of entrance into the trades of heavy industry; with the outbreak of war and its abnormality, the craft unions, hardened in monopoly, stubbornly attempted to protect their exclusiveness against the ever-growing pressure. But since the unions could accept women into their ranks or watch helplessly while women worked outside their jurisdiction, restrictions were eventually broken through with a speed which depended directly upon the need for man power and the scarcity of it. Greater numbers of welders were desperately required, for instance, to labor at the very base of modern ship construction; therefore, the first women hired to work in the crafts at Moore Dry Dock were welders. The need for expansion did not affect my own craft, that of steamfitting, so violently or so soon, and it was not until September, 1942, that a peremptory order from national headquarters compelled the local union to open its doors to women. Even then, however, the intruders were given a second-class membership, which in the Steamfitters' Union was compensated by abrogation of half the usual initiation fee, but which in all the craft unions of the shipyard tacitly implied that the emergency, union affiliation, and women's jobs would terminate together.⁹¹

Despite the government's pressure on industry to hire women, and despite the willingness of some men to recognize women's abilities, other male workers remained opposed to women's presence in the shipyards, and especially, to women receiving the same rate of pay.

The bitter cup of these malcontents was made yet more unpalatable: for doing less than a man's work – much less, in their opinion – the women nonetheless received a man's full pay. It was a conviction almost universal among the men that if women had to be introduced into the industry for lack of desirable males, it should only be as inferiors whose wages were in accord with their capacities. I found no man who would accept as valid the argument that the security of the standard wage would be threatened if women were customarily paid less for doing the same type, if not always the same quality or quantity, of work as the men, since to employers the greater skill of the man might frequently be outweighed by the woman's smaller wage. Against the concrete wall of masculine assurance that no employer would ever prefer a woman, even at half the wage, the argument was about as penetrating as birdshot.⁹²

While the men may have been right in this particular case – since women were laid off at the end of the war – we have seen that time after time, in many trades, employers have discovered that it was more advantageous to hire women at lower wages and de-skill the work by breaking it down or introducing new technology, than to retain skilled male workers at high wages.

Archibald found numerous obstacles to women's advancement in the shipyard, despite their level of skill. The end of the war and the layoffs that resulted were the end of women's hopes of secure and well-paid work in the industry.

Entering into every established craft as helpers only, women faced peculiar and discriminatory difficulties in advancing to a higher status. So far as came to my knowledge, women at Moore Dry Dock did not pass beyond the status of journeyman to the supervisory positions of leaderman or quartermen except in the despised craft of the general laborer. Further advancement was blocked by the refusal of men to work under a woman's direction. As a general policy, indeed, women were not advanced to journeymen unless it were possible to provide enough women helpers to accomplish the necessary labor without the aid of a man's greater strength. I soon learned what difficulties awaited a woman given authority over shipyard men. Assigned to a warehouse staffed mainly by older workers on the downgrade, I was presently advanced to a position of slightly increased responsibility and better pay. The protest of those who were passed by was immediate and sharp. The boss was hounded with complaints, and I was a target for sour glances and surly remarks. One disgusted fellow replied to my request for help in moving a three-hundred pound box of pipe fittings with the brusque comment, 'If you get a man's pay, I guess you can

do a man's work for it.' Weeks of time, every device of tact, and feminine sweetness were required to return the atmosphere to its normal calm.

Women were frequently shifted from boss to boss, finding a permanent place at last only on a job so routine or unpleasant as not to attract the more favored men. In any period of slowdown or changeover, discriminatory layoffs were likely to be made, and in the winter of 1943, after an important and labor-demanding contract had been completed at Moore Dry Dock, a large group of women electricians were forced to accept either a release or a pay reduction – from the amount to which their seniority had entitled them to the basic helper's wage. A year later, disproportional quitting and layoffs of the women were clearly to be seen in the statistics of employment for the entire shipyard. By February, 1945, women working in the crafts at Moore Dry Dock constituted less than ten per cent of the total personnel. Only thirteen hundred yet remained of the seven thousand who had filled the yards with femininity during the period of peak employment a year and a half before. Masculine hopes for total exclusion of the intruding group were well on the way to fulfillment.⁹³

In the decades after World War II, some women began to enter the metal trades in small numbers. It was often a struggle. In 1969, for example, Bonnie Cruz Sanchez had to sue her school to be allowed to take a metal working shop class.

Since the mid-1950s in the former Soviet Union, women have worked at the lower and middle ranges of the metal trades. "Among skilled workers, for example, women comprise 37 percent of the machinists and metal workers, but of them 73 percent operate simple machines such as drills."⁹⁴

Today, some women are finding satisfaction and success in metal trades. Sue Doro, former president of Tradeswomen, Inc., worked as a machinist for the Milwaukee Railroad, where she made train wheels. Six of the 26 tradeswomen represented in the book *Hard-Hatted Women* are metal workers: machinists, welders, and sheet metal workers.⁹⁵

Dorothy Steigler
Blacksmith
United States
1941 -

Dorothy Steigler grew up in a small town in Washington State, one of three children. She dropped out of college and married when she was 21 and had a baby. After the marriage ended three years later, she was a single mother working as an X-ray technician, a physician's assistant, and a nurse aide.

It was Dorothy's second husband who persuaded her to take a farrier class with him. She wasn't very enthusiastic at first – horseshoeing was dirty work – "but it was also very intriguing to turn a piece of iron into anything, not just a horseshoe," she said, "And I felt that there was an honesty to it. It was real sweat-of-the-brow labor."⁹⁶

Next Dorothy and her husband took a blacksmithing workshop taught by Frank Turley, who was one of the leading blacksmiths in the country and a leader in the revival of the craft. Dorothy raced ahead of the rest of the class, creating ornate hinges and a thumb latch while everyone else labored on one hinge. She and her husband had agreed before the workshop that whichever of them showed the most potential in the workshop would quit work and open a blacksmith shop. Dorothy was determined it would be her, and she proved herself.

Back at home, they set up a simple shop in a tent and Dorothy started out slowly. When some of her early projects were purchased by the museum at Southern Illinois University at Carbondale, "a school with one of the top blacksmith programs in the nation," Dorothy finally began to realize that she had talent. She began branching out, creating ornate decorative pieces.

Today, Dorothy "makes some of the best ornamental ironwork in the country.... Dorothy is part of a new generation of blacksmiths who have revitalized an old craft – and one of a handful of women in a profession that's about 99 percent male "

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Lumber and Wood Products

There are records of women woodworkers from the sixteenth through eighteenth centuries in Europe. As it was common for a skilled craftsman to teach his trade to his family, furniture makers brought up their daughters to assist them in carving and drawing.¹ There are also records of a cabinetmaker, Catherine Fromment, in Lyon, France in 1548,² and a coffin maker, Widow Evans, in Bristol, England, in 1787.³

In the American colonies, women ran sawmills, caned chairs and built furniture.⁴ The town of Petersburg, Virginia, was the center of an active furniture-making industry that included some women craftspeople in the early nineteenth century.

In fact, across Virginia a small number of women broke through that occupation's significant gender barriers. In 1802 a "Mrs. Wells" of Fredericksburg advertised her "business of AN UPHOLDSTRESS." Mrs. Rachel Atkins of Norfolk enjoyed a brief career as a "Carver, Gilder, and Picture Frame Maker." In Petersburg, Mary Mason, the daughter of chairmaker Jonathan Russell, took over an extensive cabinetmaking operation after the death of her husband, cabinetmaker George Mason. With her brother William H. Russell acting as shop foreman, she managed the business for several years until she remarried.⁵

Women also worked in the Worcester County, Massachusetts, furniture trade, which shipped more than 800,000 chairs annually to buyers around the world in the mid-nineteenth century, and was one of major furniture-producing regions of the country.

Elizabeth Stiles of Vermont established a company that supplied furniture to library reading rooms across the country. She invented and patented a design that combined several pieces of furniture for use in small areas. It was displayed in the Women's Building of the Centennial Exposition in 1876, where it won the highest award in the invention category.⁶

The year 1840 saw the beginning of a shift in the furniture trade from shop to factory-based production. The growing mechanization and specialization that accompanied this shift also created a small number of new opportunities for women as sewing machine operators in upholstery departments, and in assembling and sanding.⁷ At the same time, the introduction of other labor-saving machinery in the departments that hired women led to a decline in the jobs available to women. Between 1850 and 1905, the actual numbers of women in furniture manufacturing increased, but their proportion to the total number of workers remained constant.⁸

In 1870, women constituted only 0.5 percent of all workers in woodworking, which included furniture making, miscellaneous wooden goods, and sawmills and planing mills. By 1940, their proportion had increased to 6 percent of the total work force. Over half the women in woodworking occupations in 1940 were in the manufacture of miscellaneous wooden goods, such as clothespins, matches, baskets, wooden boxes, and similar items which are small, lightweight, and standardized. Another third worked in the

manufacture of furniture and store fixtures, and ten percent worked in sawmills and planing mills.⁹

Women who moved west in the latter half of the nineteenth century may not have been reported in the employment figures, but many of them had to learn woodworking skills for survival. Lizzie Simons, a pioneer "whose husband joined the Texas forces during the Civil War, wrote out a long list of the 'unladylike jobs she had to perform' in his absence. Among other things, "she found she had to become a cooper and caulker to keep her tubs and barrels in order."¹⁰

African-American women under slavery in the nineteenth century worked as lumberjacks.¹¹ Before World War I, African-American women worked in furniture factories, and a few were skilled upholsterers.¹² In 1930, lumber was one of the seven occupational fields employing the largest numbers of African-American women.

The situation was slightly better in Canada. In the report of the 1871 Census, woodworking employed at least 500 women, making it one of the top four occupational categories. Several sawmills and furniture factories "employed at least 100 women and girls throughout Canada but the female share of the total work force in each type was below 5 per cent."¹³

E.B. Eddy's saw mill and match and pail factory at Hull Quebec reported the largest number of female employees in any wood-processing enterprise, with 140 girls mainly occupied in the match production division of the business. But there were 199 other establishments in this sector that employed at least one women or girl. Robert Hay employed 50 women in his Toronto furniture factory, by far the largest in any Canadian furniture factory. But there were 50 other furniture establishments that reported female workers, such as William Drum's factory in Quebec City.¹⁴

The Census also showed that 37 women owned sawmills in Canada. "In value of output, the largest enterprise headed by a woman in 1871 was Marianne Supple's saw mill in the village of Pembroke, Renfrew County, Ontario, in which 20 men and two boys were employed producing lumber valued at \$150,000."¹⁵ Esther Ennis of Ennisville, Drummond Township, Ontario, owned a sawmill, along with oatmeal and flour mills, employed a total of 24 men, and produced products worth \$46,670. Sibyl Ryan's saw mill in King's County, New Brunswick employed 3 men.¹⁶

Gains in the first part of the twentieth century were slow, and although some women learned woodworking skills in factory jobs or from relatives, most of the avenues for training were closed to them. In many cases, girls were denied entry into shop classes in school, even as recently as the late 1980s. In 1971, Bonnie Edelhart, a junior high student, sued the New York City Board of Education and others for preventing her from taking shop courses. Since 1978, all vocational classes have by law been open to all students regardless of gender.

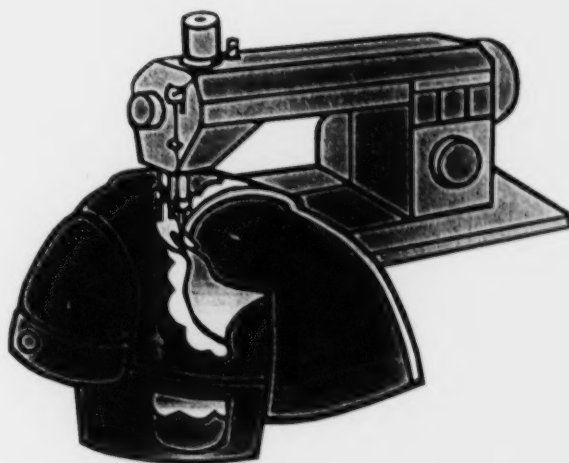
Eleanor P. Vance and Charlotte L. Yale
Woodcarvers
United States
1915

"Woodcarvers Eleanor P. Vance and Charlotte L. Yale moved into a cottage on the Biltmore Estate near Asheville, North Carolina, in 1901. Little knowing she was launching the first of the Biltmore Industries, Vance started a wood carving class for four boys who had been watching her work. In 1915 Vance and Yale moved to Tryon, North Carolina, and established the Tryon Toy Makers and Wood carvers, beginning with woodcarving classes for children. Soon the industry was producing shelves and tables, carved and joined Gothic benches and many other special-order items, and handmade toys reflecting Blue Ridge Mountain life and biblical times."¹⁷

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- ¹ Ivy Pinchbeck, *Women Workers and the Industrial Revolution, 1760 - 1850* (London: Frank Cass and Co., Ltd., 1977 (1930)), 282.
² Natalie Zemon Davis, "Women in the Crafts in Sixteenth-Century Lyon," in *Women and Work in Preindustrial Europe*, Barbara A. Hanawalt, ed. (Bloomington: Indiana University Press, 1986), 181.
³ Pinchbeck, 286.
⁴ Barbara Mayer Wertheimer, *We Were There: The Story of Working Women in America* (New York: Pantheon Books, 1977), 13.
⁵ Jon Prown, *Journal of Early Southern Decorative Arts* Volume XVIII, Number 1 (May, 1992): 103.
⁶ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 94-6.
⁷ Janet M. Hooks, *Women's Occupations Through Seven Decades (Women's Bureau Bulletin No. 218)* (Washington, D.C.: U.S. Government Printing Office, 1947), 118-9.
⁸ Helen L. Sumner, *History of Women in Industry in the United States* (New York: Arno Press, 1974), 225-6.
⁹ Hooks, 118.
¹⁰ Sandra L. Myres, *Westering Women and the Frontier Experience 1800-1915* (Albuquerque: University of New Mexico Press, 1982), 163.
¹¹ Wertheimer, 118.
¹² Gerda Lerner, *Black Women in White America* (New York: Random House, 1972), 258.

- ¹³ Elizabeth Bloomfield and G.T. Bloomfield, *Canadian Women in Workshops, Mills, and Factories: The Evidence of the 1871 Census Manuscripts* (Guelph, Ontario: University of Guelph, 1991), 37-8.
- ¹⁴ Bloomfield, 65-6.
- ¹⁵ Bloomfield, 69.
- ¹⁶ Bloomfield, 69.
- ¹⁷ Lois Decker O'Neill, *The Women's Book of World Records and Achievements* (Garden City, NY: Anchor Press/Doubleday, 1979), 123-4.

T E X T I L E S



Textiles

Ancient Worlds

Spinning and weaving, the basic processes of textile manufacture, are among the oldest human trades practiced in nearly every culture around the world. The particular activities of the trade "are undertaken by women in some cultures around the world, and by men in others."¹ Ehrenberg also notes that "the status derived from the craft also varies tremendously; in some societies – usually, it seems, those in which the task is performed by men – it is well regarded, whereas in others, often those in which women are the spinners and weavers and where women have low status, the craft confers no particular status on the craftswoman."² As we shall see in the history of weaving in medieval Europe and the American colonies, the trade has moved back and forth between the sexes.

The precise origins are lost in time, but it appears likely that women, as the first gatherers and growers of plants and the first tenders of livestock, were the inventors of the textile trade. The oldest woven textiles date to 5500 BC, from the Neolithic city of Catal Huyuk, located in what is now Turkey. One writer referred to the loom as "that great mechanical invention of Neolithic women."³

Ancient Chinese historians credit the invention of spinning to a woman named Yao, who was wife of the fourth emperor, and the discovery of silk they attribute to Hsi-Ling Shih, wife of an emperor 6000 years ago. According to Matilda Joslyn Gage, she was worshipped as the goddess of silkworms well into modern days. The Chinese kept the process of silk production secret for centuries, and the fabric "formed an export of extraordinary value, its weight in gold being paid by Roman emperors for a garment."⁴

A thousand-year-old manuscript now in a museum in Kyoto, Japan, tells how Korean women weavers took the art of silk weaving to Japan. Many Japanese believe, however, that it was a Japanese woman who first unraveled the secrets of silkworms and invented silk weaving, setting the foundation for the development of a huge industry of women spinning and weaving silk.⁵

In the art and records from ancient Egypt, there are several depictions of women as "overseers of weavers" or "overseers of the house of weavers."⁶ Apparently, most of the spinning and weaving were done by women, a theory supported by the fact that the Old Kingdom hieroglyph for weaver showed a female figure. During the Old and Middle Kingdoms, women predominated in the spinning and weaving trades, and weaving was done on the horizontal loom. However, in the New Kingdom period, with the introduction of the upright loom, men become more frequently depicted as weavers.⁷ Once again, a shift in technology appears to have precipitated or accompanied a shift in occupational gender roles.

In Roman times, women dominated the manufacture of textiles, producing wool and linen.⁸ Cotton was a luxury import in Rome, and was not manufactured in most of Europe until the twelfth century. Silk manufacture was first introduced into the Western world through "a historic coup of industrial espionage in the sixth century,"⁹ when two

Greek monks visiting China smuggled some silk worms back to the Byzantine empire. Silk manufacture was not developed in the rest of Europe until five or six hundred years later.

Europe, 8th - 19th Centuries

Textile manufacture in the early Middle Ages continued much as it had in Roman times. "Free women and serfs worked in their homes, slave women in the workshops (gynaecea) of the great estates. Almost every estate of any importance had a gynaeceum."¹⁰ Women's tasks included spinning and weaving, shearing sheep, crushing flax, combing wool, and cutting and sewing garments.

The techniques and processes of textile production, especially spinning, continued virtually unchanged for centuries. "Primitive though the technology seems, hand spinning created an excellent product, one not easily matched by machinery even centuries later."¹¹

Because it took many spinners to supply one weaver,

The process [of spinning] never ceased, and the skill was universal, especially for women of the lower classes, who always had spindle in hand, even while cooking, feeding livestock, or minding the children (or, to believe one medieval miniature, having sex). Spinning was so identified with women that the female side of the family was known as the "distaff side," or the "spindle side."¹²

Textile production evolved into a family-based industry as slavery declined and the gynaecea disappeared in the early Middle Ages. With this new organization of production came other changes. One of the first trades to experience these changes was dyeing, which was "among the most demanding of cloth techniques, [and] required a knowledge of fabrics, dyes, and mordants (color fixatives) and by the twelfth century had been taken over almost completely by men."¹³ Then,

beginning in the thirteenth century, however, particularly in some urban areas and in monasteries, male artisans began to take over some stages of production from women, gradually forming guilds of weavers, drapers, and cloth cutters.... Although some guilds allowed female members at the beginning, women were gradually excluded from most [textile] guilds in most cities.¹⁴

It became the male head of the household who was the weaver, while the women of the household prepared and spun the yarn for his loom.¹⁵

Women did continue to dominate certain skilled trades, such as silk weaving in Paris and London, in the thirteenth century. In some cities, the silk guilds had only women members. English records show that women worked independently as weavers, dyers, fullers, and seamstresses into the late 1300s.¹⁶ In the town of Exeter, Joan Blakhay

was the registered apprentice of a weaver in 1380, but she was the only woman weaving apprentice found in the records for that period. Another woman, Alice Greneweeye, worked as a weaver but was classified as a servant, so we see the shift happening here in these women's lives.¹⁷ Exeter had an active textile industry in the late fourteenth century, and it was second only to the food and beverage industry in the employment of women. There were a few women in high-status positions as drapers, those who organized the production of cloth, and other women who worked as weavers, tailors, hosiers, and dressmakers – trades that required skill and training, and had the potential for profit. One such woman was Emma Hosiere, who ran her own business making stockings. But most women in Exeter's textile industry worked in the low status, menial jobs of combing, washing, and spinning. Often their names reflected their occupations: Isolda Spynnestere, Cecilia and Joan Kemestere (wool combers).¹⁸

The textile industry in Bristol, England, experienced difficulty in the late fifteenth century. With many weavers out of work, ordinances were passed prohibiting textile employment for women on the assumption that working women took jobs away from men.¹⁹

The city of Leiden also had a drapery (textile industry) that grew to international renown by 1450. Between 1371 and 1419, twenty-five percent of the retail merchants of good cloth, positions that required capital and expertise, were women. Women were also 20 - 25 percent of the drapers. Draping was another high-status occupation, and because it was never organized as a guild in Leiden, women continued to work in the trade. During the sixteenth century, as the industry began to collapse, there were no women working as skilled weavers or fullers, but a few held on as dyers and finishers in the early part of the century. The finishers organized in 1508 and passed an ordinance forbidding women to train in the fulling trade. Dyers never organized, but the only route in for women was to be in partnership with a husband who was a dyer. Until the late sixteenth century, women continued to weave linen and cheap woolen and wool blend fabrics, until those crafts were also organized.²⁰

Silk making was a family trade in sixteenth century Lyon, in which the wife and women of the household traditionally unwound the cocoons, spun, and prepared thread for the bobbins, while the husband worked at the loom. It was still common, however, for the wife to relieve her husband at the loom. An ordinance passed in 1554 allowed open access to the trade, but as the market became less stable in 1561, guild masters agreed to limit the number of apprentices to two men and no women. All masters were to send their female apprentices away, but women who had already completed their apprenticeships could be hired to work at the looms. Apparently, some did not follow these new regulations, as there were still attempts to enforce them as late as 1583, when a new ordinance stated the only legal female apprentices were orphan girls.²¹

Knitting was a new craft that first appeared in Spain in the early sixteenth century and quickly spread throughout the rest of Europe. At first, it was a "free" craft, that is, unorganized and open to any one. Gradually the weavers or cloth dealers guilds in various cities began to demand that knitters join them and pay the guild fees. As weavers found themselves out of work, many of them took up knitting and demanded that women pay full guild fees or be prohibited from knitting. In most cases, the city councils were unwilling to completely close off knitting as a free craft, and women were allowed to

continue knitting some items. Stocking knitting, however, was limited to male masters. When the new knitting frame, which vastly increased a knitter's speed and production, was introduced in 1598, only male masters were permitted to use it.²²

In addition to the crunch of economics, the development of new technology also contributed to the exclusion of women from skilled work in textiles. This happened as early as the fourteenth century in northern Italy, and in fifteenth and sixteenth centuries England, women were prohibited from learning to use the new looms. In some cases, weavers claimed that the new, larger looms required more strength than women had. Usually, these looms were used to produce expensive luxury cloths, so women were effectively limited to producing the cheaper goods.

Hostility toward women in the trade continued to grow. By the mid-seventeenth century, "only the initial stages, such as carding and spinning, or the production of cheaper cloth, especially that specifically made for women's clothing, such as veils, were left to unorganized women workers."²³ These were the lowest paid and least pleasant tasks in the cloth industry, and "work that they *could* do part time even if they needed to work full time to support themselves."²⁴ In Germany and England, spinners were paid very low wages, and most were unable to support themselves, let alone their families. Many spinners were forced to apply to their city councils for poor relief.²⁵

United States and Canada

With the colonization of the American colonies, and the labor shortages and home-based industries that developed, textile production once again became the province of women. The female householder and the female indentured servant spent much of their time spinning and weaving cloth for home use. When the industry moved into factories in the nineteenth century, women and children went with it as laborers.

Women also dominated in clothing production. A report by the National Trades' Union stated that tailoring was one of several trades that were "in a certain measure governed by females."²⁶ In Canada in 1871, clothing production was the greatest employer of women, with textiles coming in second. Three quarters of the clothing workers and just under half of the textile workers were women. Large numbers of women worked at handlooms, and there was considerable variation in how the census takers reported this work – if they reported it at all.²⁷

Women inventors in the nineteenth century were active in the area of textile and clothing manufacture. Writing in the latter part of the century, Matilda Joslyn Gage listed some of their accomplishments:

Among recent inventions of importance by women, are a spinning machine, capable of running from twelve to forty threads; a rotary loom, doing three times the work of an ordinary loom; a wool feeder and weigher, one of the most delicate machines ever invented, and of incalculable benefit to every woolen manufacturer; a self-fastening button.... Many improvements in sewing machines have been made by women...²⁸

20th Century

Thanks to the changes of the Industrial Revolution, women in many European countries had returned to the textile industry, albeit in unskilled and semi-skilled positions. These gains fell off again in the 1920s and 1930s, when the textile industry declined due to competition from synthetic fabrics.²⁹

In the United States in 1940, "about half of the 31,606 women manufacturing foremen were in textile, textile product, and apparel industries," which included an increase of approximately 5,000 women textile and apparel foremen.³⁰ The clustering of women supervisors in the textile trades can probably be attributed to the fact that they were supervising women workers in factory settings.

¹ Margaret Ehrenberg, *Women in Prehistory* (Norman: University of Oklahoma, 1989), 34.

² Ehrenberg, 34.

³ Ruby Rohrlich-Leavitt, "'Women in Transition: Crete and Sumer,'" in *Becoming Visible: Women in European History*, Renate Bridenthal and Claudia Koonz, eds. (Boston: Houghton Mifflin Co., 1977), 39.

⁴ Matilda Joslyn Gage, "Woman as Inventor," in *Women's Almanac: 12 How-To Handbooks in One*, Kathryn Paulsen and Ryan A. Kuhn, eds. (New York: Armitage House/Information House, 1976), 345.

⁵ Mary R. Beard, *On Understanding Women* (New York: Grosset & Dunlap, 1931), 54.

⁶ Gay Robins, *Women in Ancient Egypt* (Cambridge: Harvard University Press, 1993), 119.

⁷ Robins, 119.

⁸ Frances Gies and Joseph Gies, *Cathedral, Forge and Waterwheel* (New York: Harper Collins, 1994), 49.

⁹ Gies, 50.

¹⁰ Gies, 49.

¹¹ Gies, 51.

¹² Gies, 51-2.

¹³ Gies, 120.

¹⁴ Merry E. Wiesner, *Working Women in Renaissance Germany* (New Brunswick, NJ: Rutgers University Press, 1986), 173.

¹⁵ Gies, 118.

¹⁶ Ann Oakley, *Woman's Work: The Housewife, Past and Present* (New York: Vintage Books, 1974), 19.

¹⁷ Maryanne Kowaleski, "Women's Work in a Market Town," in *Women and Work in Preindustrial Europe*, Barbara A. Hanawalt, ed. (Bloomington: Indiana University

- Press, 1986), 163.
- ¹⁸ Kowaleski, 152-3.
 - ¹⁹ Bonnie S. Anderson and Judith P. Zinsser, *A History of Their Own: Women in Europe from Prehistory to the Present*, vol. 1 (New York: Harper & Row, 1988), 408.
 - ²⁰ Martha C. Howell, "Women, the Family Economy, and Market Production," in *Women and Work in Preindustrial Europe*, Barbara A. Hanawalt, ed. (Bloomington: Indiana University Press, 1986), 202-5.
 - ²¹ Natalie Zemon Davis, "Women in the Crafts in Sixteenth-Century Lyon," in Hanawalt, 185-6.
 - ²² Wiesner, 180-1.
 - ²³ Wiesner, 173.
 - ²⁴ Wiesner, 185.
 - ²⁵ Wiesner, 185.
 - ²⁶ Helen L. Sumner, *History of Women in Industry in the United States* (New York: Arno Press, 1974), 17.
 - ²⁷ Elizabeth Bloomfield and G.T. Bloomfield, *Canadian Women in Workshops, Mills, and Factories: The Evidence of the 1871 Census Manuscript* (Guelph, Ontario: University of Guelph, 1991), 37.
 - ²⁸ Gage, in Paulsen, 346.
 - ²⁹ Renate Bridenthal, "Something Old, Something New: Women Between the Two World Wars," in *Becoming Visible: Women in European History*, Renate Bridenthal and Claudia Koonz, eds. (Boston: Houghton Mifflin Co., 1977), 430-1.
 - ³⁰ Janet M. Hooks, *Women's Occupations Through Seven Decades (Women's Bureau Bulletin No. 218)* (Washington, D.C.: U.S. Government Printing Office, 1947), 197.

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Leather and Fur

The processing of animal skins for fur and leather clothing and goods most likely developed among hunting and gathering cultures in cool climates. In most of these cultures, hunting was primarily a task of men, while treating the hides became the specialized task of women.¹ Because women were the ones working the hides, it is most likely that they discovered or invented the techniques for tanning and preserving animal skins.

This pattern is borne out in the customs of many native groups in North America. Women of the plains tribes that depended heavily on buffalo were responsible for butchering the animals and treating the hides. As mentioned in the section on food processing, the butchering had to happen quickly because the meat spoiled easily without refrigeration. But after the butchering, "the hides also had to be dealt with immediately, scraped clean of adhering fat and tissue while still warm, or they became so stiff they were difficult to tan."²

Among the Montagnais-Naskapi people of Labrador, Canada,

all adults participated in the procuring of food and manufacture of equipment necessary for life in the north. In general, women worked leather and bark, while men worked wood, with each making the tools they needed. For instance, women cut strips of leather and wove them onto the snowshoe frames that were made by men... Women skinned game animals and cured the hides for clothing, moccasins, and lodge coverings.³

In later years, after contact with white culture and the resulting trade that developed, women had even more responsibility "because they alone had the skill to tan the hides of deer, elk, and buffalo."⁴ Native American author Rayna Green suggests that the practice of polygamy became more common due to the fur trade. "Having more laborers in a family to prepare hides increased revenue, which was clearly necessary to Indian peoples forced to rely on white goods."⁵

Furthermore, as we shall see later, European fur traders' success and survival was dependent upon the skills of the Native American women they married.

Europe, to 1900

Women were active in the early leather-worker guilds in the Middle Ages. These guilds covered workers in leather as well as workers in leather combined with wood or metal.

The right to work in part of this trade was granted in the days of Louis VII as a monopoly to a widow named Thecia and to her descendants. They

processed the leather and made leather belts, straps, gloves, shoes and pouches in which seals, silver, documents, prayer missals and toilet articles were kept. In 1287 the monopoly was again granted to a woman denoted as Marcelle.⁶

Women also manufactured caskets with combinations of wood, leather, and metal.

In thirteenth-century Lübeck widows continued their husbands' trades as shoemakers, tanners, and saddle makers, but other guilds excluded them from trades such as boot making and harness making.⁷ When Cologne chartered its guilds in 1397, leather working was open to women, either as widows or independent *femmes soles*.⁸ In other towns, women worked in the furrier,⁹ glove making, purse making, and skinning trades.¹⁰

In fourteenth-century Exeter, England, women worked primarily in three trades: candle making, leather working, and textiles.¹¹ Few women in Exeter, however, worked solely in the leather trade, as Maryanne Kowaleski explains:

Only five of the twenty identified in this craft from 1373 to 1393 practiced the trade with any regularity, and three of the five were employed in other occupations as well. Moreover, at least three of the female leather-craft artisans had husbands working in the same craft. Clearly female participation in leather-finishing crafts, an important industry in the local economy was quite limited; indeed, only 2 percent of the 1031 fines assessed on those involved in the hide and skin trade in Exeter from 1378 to 1388 were directed at women. A variety of factors may explain women's low level of activity in this industry; for one, freedom membership was desirable in purchasing necessary raw materials (hides, skins, and unfinished leather). Second, a sizable capital outlay was needed not only for raw materials but also for requisite tools, tanning agents, and a workshop. Third, the time commitment, in terms of both the training demanded and the slowness of the leather process, was more substantial than most married women or mothers could afford. The medieval Exeter woman's lack of civic economic privilege and access to capital and training opportunities effectively barred her from anything more than minimal participation in one of the town's most vital industries.¹²

It may also be possible that, as was the case with other trades in other towns, that married women worked with their husbands in homebased workshops, and most of the work was done under the husband's name during his life.

United States and Canada to 1900

One of the earliest European activities in what are now Canada and the northern United States was the fur trade. The French created the Company of Habitans to handle

the trade in the mid-1600s. As one historian noted, "even some women, [such] as the Aulmus sisters engaged in the Indian trade,"¹³ but unfortunately he gave no further information about them, except that they were accused of trading with the Dutch. This was a common accusation, and probably well-founded, for the Dutch paid higher prices than the French.

In the 1820s, three women, Madeline La Framboise, Elizabeth Mitchell, and Thérèse Schindler were some of the "most successful fur traders in the Great Lakes region."¹⁴ La Framboise was apparently the widow of Joseph La Framboise, also a trader. She "claimed American citizenship, [and] employed five men with French names as boatmen to carry on all her operations" on the Big Sioux.¹⁵

When the European trappers first arrived, they had no knowledge of the tribes with which they were to trade, nor of basic survival in the cold northern wilderness, or even, in some cases, how to treat and preserve the hides they traded in. The French were fairly quick to marry Native women and make use of their special skills. The British were slower, allowing expeditions to fail repeatedly before they included women in the expedition, as their Native guides had recommended.¹⁶

Indeed, the Native women of many tribes provided skills the traders needed: they helped manufacture and maintain the birch bark canoes used to travel the rivers; they acted as guide and pilots for the canoes; they knew the wilderness and how to survive in it; they interpreted for the foreigners and assisted their negotiations with various tribes.¹⁷ "Of particular importance to the inexperienced Hudson's Bay Company men was the women's knowledge of dressing furs. As the York Council emphasized to its London superiors, the Indian women 'clean and put into a state of preservation all Beavr. and Otter skins brought by the Indians undried and in bad Condition.'"¹⁸

The traders also owed their very survival to the women:

The fact that it was the woman's role in Indian society to snare small game served the traders well. On one occasion, the Indian wife of the bourgeois John Dugald Cameron reputedly kept the people at her husband's post alive with the catch from her snares. The young Nor'Wester George Nelson was certainly grateful for his Ojibwa wife when he found himself in dire straits at a small outpost north of Lake Superior in 1815. After provisions became almost exhausted in February, Nelson's wife set out, well equipped with snares of wire and twine, to catch small game. At first, she had little success because wild animals were devouring her catch before she could return to the snares. After about a week, however, she came in with sixteen partridges and went off with one of the men the next day to bring home the thirty hares which she had cached. Nelson's wife had been accompanied by the wife of one of his Hudson Bay Company's competitors, but although the Nor'Wester knew he might be censured for allowing this, he felt his wife's welfare must come before commercial rivalry.¹⁹

Women in the American colonies worked at a variety of trades. They cut and stitched leather goods,²⁰ and some were independent tanners and shoemakers.²¹ A listing

of Southern women and their occupations in the eighteenth century includes Mary Wilson, shoemaker; Catherine Park, tanyard owner and manager; Mary Robinson, tanner and leather dresser; and Elizabeth Kelly, who sold and repaired whips.²²

Harriet Martineau in 1836 included shoe making on her list of eight occupations open to women.²³ In the same year,

The saddlery business in the New England States, like the manufacture of brushes and whips, was referred to ... by a committee of the National Trades' Union (which was appointed to inquire into the evils of female labor) as "in a certain measure governed by females." And in 1851 it was said that in New York "a large number of females" were employed at very fair wages in the manufacture of leather goods. They appear to have been engaged in sewing by hand the lighter materials.... In 1871... a "lady" saddlery and harness dealer in Chicago is said to have employed more than a hundred women upon "blankets, nets, wraps, etc."²⁴

Another woman, described as "a practical woman machinist, who for many years carried on a large harness manufactory in New York City," was credited with the invention of an adaptation of sewing machines for stitching leather.²⁵

In 1820, there were 79 women (and 1,009 "boys and girls") reported working in the leather industries, not including boots and shoes,²⁶ and "up to 1890 the number of women workers in tanning, currying, and finishing leather had never reached 300."²⁷ New tanning machinery introduced between 1890 and 1900 led to the employment of women and girls in positions previously held by men, and by 1920 the number of women in the tanning industry was nearly 4500.²⁸ In 1940, women in tanning outnumbered men in primary leather processing by more than 5 to 1. This branch of the industry produces pocketbooks, luggage, and leather gloves and mittens – processes that require stitching which usually employs women. In 1870 women were only 2 percent of all leather products workers, but their proportion rose to 47.5 percent in 1940.²⁹

The Canadian Census of 1871 showed the leather-working industry was the third largest employer of women and girls, with women and girls making up 25 percent of all leather workers.³⁰ Their work tended to fall into well-defined categories by gender.

Men and boys remained dominant in tanning, saddlery and harness-making and the artisanal craft of boot- and shoe-making that were ubiquitous through the settled districts of Canada. Women and girls were employed in large numbers to operate stitching machines in the new shoe factories that used machinery for mass production of footwear, mainly in the largest cities. Much smaller numbers of female workers were also engaged in the manufacture of gloves and other miscellaneous leather goods.³¹

Fourteen women owned leather goods businesses in Canada in 1871. One of these was Jane Darch, who remained active in the business for many years. "The business was listed in her name in directories and the Dun reference books, and the corporate name of

Jane Darch & Sons was still visible atop a 6-story building on London's [Ontario] Talbot Street in the 1980s."³²

After her husband died in 1865, Jane Robertson Wissler of Salem in Nichol Township, Ontario, continued to run the tannery and sawmill he had started. In the 1871 Census, she was still listed as the proprietor. "The tannery employed seven men for the full year and produced leather valued at \$9,000."³³ With more than six employees, The Salem Tannery was larger than the average establishment in Canada at the time.

In the period between the two World Wars, in both France³⁴ and the United States,³⁵ the numbers of women employed in leather working and tanning rose.

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FOOD
PROCESSING



Food Processing

While it is generally expected in this culture that women are the primary cooks at home, they are not expected to be the great chefs. This may have come about through the division of responsibility in which women's primary sphere of activity became the private arena (home and child-rearing, and by extension, the nearby activities of the garden and small-scale animal husbandry), while men's sphere became the public arena (the fields, large-scale animal husbandry, woods, and business). Nonetheless, women have historically been involved in commercial food processing, especially in the brewing of beer.

Ancient

Fermentation appears to have been discovered in the ancient Mid-East. This important discovery, which caused the conversion of grape juice into wine and cereal grains into bread or beer,¹ made possible the production of nutritious foods and beverages that could be stored.

In the Middle Kingdom period of ancient Egypt the occupations of "brewer" and "miller" were associated with women. Both men and women are included in depictions of baking and brewing from the Old Kingdom through the New Kingdom periods. In some cases, women are shown performing all the tasks of bread making, and it appears that women were responsible for most grain milling.² Women also worked at grain mills in ancient Pompeii.³

Europe through the 17th Century

During the Middle Ages, women, particularly in England, had a monopoly on the brewing trade. They produced the nutritious beer and ale that were the staple beverages of the period. "Brewing was important, since before cheap sugar became available, beer was an essential nutrient; it was drunk at every meal by everyone, including small children."⁴

Brewing was a trade that was conducted in the home, both small-scale for home consumption and large-scale for commercial sale. Brewing on a commercial scale required investment in equipment, such as large vessels, and was most often conducted by the women in well-to-do peasant families with the assistance of servants.⁵

"Brewing was an arduous and rather dangerous activity since it involved carrying 12-gallon vats of hot liquid and heating large tubs of water.... Five percent of the women in coroners' inquests lost their lives in brewing accidents."⁶ One such death was reported as follows:

About noon on 2 October 1270 Amice daughter of Robert Belamy of Staploe and Sibyl Bonchevaler were carrying a tub full of grout between them in the brewhouse of Lady Julia de Bauchamp in the hamlet of Staploe in Eaton Socon, intending to empty it into a broiling leaded vat, when Amice slipped and fell into the vat and the tub on top of her.⁷

Brewing was one of the major activities of women during the Middle Ages. In the English region of Brigstock during the fourteenth-century, for example, "more than one-third of the women identified in the court rolls of Brigstock were cited on at least one occasion for selling ale."⁸

Although women monopolized the brewing trade throughout the Middle Ages, they were excluded from the commercial side of the trade by the end of the seventeenth century. Women did, however, continue to brew for home use.⁹

As with beer, women were active in the production of bread in the Middle Ages. The two trades were closely related, since they involved the processing of cereal grains with yeast. In fact, the first steps of the brewing process involved the production of a yeasty dough. In seventeenth century, "women produced most of the bread and beer in England, [and] women were members of the ancient bakers' companies on the same terms as men."¹⁰ As with many other trades, a woman often worked with her husband and continued the business after his death.

It appears that women did not dominate the baking trade as they did brewing. For example, in the records of sixteenth-century France, only an occasional widow is mentioned as a baker. In one region, there was only one woman on a list of 48 bakers.

We still find the legacy of women brewers and bakers in English family names. The suffix "-ster" in Old English referred to a woman's occupation. The Old English nouns for baker were *bæcere* (masculine form) and *bæcestre* (feminine form), which survive in current English as Baker and Baxter.¹¹ Likewise, we have the names Brewer and Brewster.

Women also worked as butchers, though perhaps in lesser numbers than as brewers and bakers. The tax records for Oxford, England in 1380 show women and men both as butchers,¹² and a Widow Barker was listed as a butcher in Bedford in 1783.¹³ Another woman butcher in eighteenth century London "lived by killing beasts in which ... she was very expert."¹⁴

Natalie Zemon Davis discovered that in sixteenth-century Lyon,

especially there were females running butcher shops. Some *bouchières* were poor, such as Monde Bazare, who entered the hospital in 1560 having "nothing," and some "*marchandes-bouchières*" were well off, such as widow Estiennette Moyne, official purveyor of meat to the hospital a few years later.¹⁵

During the Renaissance (the late 15th and 16th centuries) in Italy, Jewish women, particularly those of the upper class, were often well-educated. "A fascinating by-product of the thorough education of women in Jewish ritual and Law, was their employment by the community as *shochtot* (ritual meat slaughterers)."¹⁶

United States and Canada

Native American women, like women everywhere, were responsible for most of the food processing for their tribes and families, but the details varied from tribe to tribe.

It has been estimated that in some Native American hunting and gathering societies, women contributed as much as eighty percent of the labor needed for producing the family food supply. This included not only the time they spent gathering and raising plant foods, but also the labor they contributed toward butchering, drying, and cooking the game brought in by the men.... Hornaday estimated that a whole buffalo cow yielded fifty-five pounds of pemmican and forty-five pounds of dried meat if it were economically worked up. A woman who was extremely skilled could butcher three buffalo a day, but this output was beyond the average worker. Because there was no refrigeration, the meat had to be attended to fairly soon to prevent spoilage.¹⁷

Navajo women owned and managed livestock, tending the sheep throughout their lives, from birth "until the day she butchered them and they ended up in her cooking pot."¹⁸ In contrast, "Hidatsa women procured and processed all food resources, with the exceptions of killing and butchering animals ... which were male tasks."¹⁹

During the colonial period, women brewed and sold ale and beer.²⁰ They also ran gristmills and slaughterhouses.²¹ In the Southern colonies in the 18th-century, there is a record of two women butchers, Margaret Oliver and her mother.²²

During the 19th century, women operated various mills. For example, Elizabeth Stone of Fort Collins and Sara Cockrell of Dallas operated flour mills.²³ The Canadian census of 1871 listed 39 women as proprietors of flour mills or other businesses in the food and drink sector.²⁴ The census also showed that "though the food and drink industries reported nearly one thousand women and girls, there was only one female for every twelve male workers"²⁵ and in flour milling and bakeries, women and girls were only 5 per cent of the work force.²⁶

Women joining the flood of inventive enthusiasm in the 19th-century contributed many new inventions to the field of food processing. Mary Evard patented a stove in 1868 that could do dry and moist baking simultaneously.²⁷ Nancy Johnson patented the hand-crank ice cream freezer in 1843. She sold her patent rights for \$1500, which was a good sum at the time.²⁸ Elizabeth Hunt patented fruit jars (1865) and improved packages for preserving fruit (1876). Sarah E. Saul patented an improved churn (1865) and a boiler for culinary purposes (1866).

The twentieth century brought women who started major companies in the food processing business. For example, Melitta Bentz, a housewife in Dresden, Germany, "became annoyed with the time-consuming method of brewing coffee by wrapping the loose grounds in a cloth bag and boiling water around it."²⁹ Furthermore, the coffee was bitter and grainy. She had a brilliant thought, and cut a sheet of blotting paper to fit the bottom of a pot she poked full of holes. She added the coffee and poured boiling water

over it. The resulting coffee was better tasting without the grains. In 1909 she and her husband took samples of her new filtration coffee-making system to the Leipzig fair and sold over 1200. It was the beginning of the Melitta Company. "The Melitta coffeemaker is used today in 150 countries worldwide; two thirds of American coffee drinkers use the drip preparation method."³⁰

Catherine T. Clark founded Brownberry Ovens, Inc., in Wisconsin in 1946. She started with two recipes for white and whole wheat bread, and made \$68 profit in her first year. "In 30 years she was making 14 kinds of bread, six types of rolls, and croutons, with annual sales of \$25 million in two plants."³¹ She sold the company for \$5.5 million in 1972.

Rose Knox became president of the Knox Company, which makes gelatin for food and industrial use, in 1925, and oversaw the development of the company from a value of \$300,000 to over \$1 million. She said she was "determined to run the business in a woman's way," and did so by instituting one of the first five-day work weeks, keeping her plants spotless and pleasant, and winning exceptional loyalty from her employees. She remained in control of the company until she was in her 80s, when she turned it over to her son.³²

Pepperidge Farm Bakeries began with Margaret Fogarty Rudkin baking bread for her children and neighbors. She started selling her bread in local stores, then founded Pepperidge Farm Bakeries in 1938. In the first year, it produced 4,000 loaves of bread, which sold with little advertising. Rudkin handled production and personnel, and her husband took over the finances and marketing. The company grew rapidly and added many products to its line.³³

Nicole-Barbe Clicquot

Vintner

France

1777 - 1860s

The sparkling wine invented by Dom Perignon and known as champagne was considered a fad for the first hundred years of its existence. The problem was that the yeast and sugar that produced the effervescence also created a sediment that clouded the wine. It was a young widow, Nicole-Barbe Clicquot, who devised a method of clarifying champagne and thus ensured its continuing popularity.

Mme. Clicquot was born in 1777 to upper class parents, and married a M. Clicquot, a vintner who owned a champagne winery and shipping firm. When he died two years later, she was just 20 years old and the mother of an infant daughter. Much to the surprise of the wine industry, La Veuve (The Widow) Clicquot decided to continue the business herself. Many predicted she would go broke within two years.

When she took over the winery, the champagne industry was dying and the Napoleonic Wars had the French economy in upheaval. She took on a business partner to

help with marketing, a M. Werle who later rose to prominence in local politics and whose descendants continue the business to this day.

To improve the quality of the champagne, Mme. Clicquot developed a process for removing the sediment without losing the effervescence as well. "Under the *remuage* ('moving') method that Clicquot invented, the corked champagne bottles are stored upside down, or *sur pointe*. Over the course of several months, individual bottles are shaken and turned daily, and the sediment gradually slides down to rest against the cork. At the right moment, the bottle is opened for an instant: the pressure expels the sediment and the cork is quickly reinserted."³⁴ This method is still in use today. Clicquot also invented pink champagne by pressing the grapes as soon as they were harvested.

These innovations were enormously successful. Clicquot and Werle "were largely responsible for creating a demand for champagne in the European capitals, and for breaking the import duties imposed by England."³⁵

Rather than going broke, Mme. Clicquot made herself a rich woman, and retired when she was 43. "Today the Clicquot vineyard, third largest champagne house in France, is run by a descendant of the Werle family, but the labels still bear the name of La Veuve Clicquot-Ponsardin,"³⁶ and is sold in fine restaurants worldwide.

Amanda Theodosia Jones
Inventor, Vacuum Canning
United States
1835 - 1914

Amanda Theodosia Jones was an active medium in the spiritualist movement of the mid- to late-nineteenth century. The spiritualist movement had strong feminist foundations, and advocated women's right to control their own bodies, wear comfortable cloths, gain custody of their children, and own property.³⁷ Jones put her feminist principles into practice in her company, which canned foods by a vacuum process she invented and patented with her cousin Leroy C. Cooley.

Jones' inspiration for the new canning process, which made it possible to preserve food without cooking out all the flavor, came as a message from her spirit guide. Because she had never canned or invented anything, she was inclined to believe the message was for someone else. But spirit guides can be insistent, as she discovered, and Jones went to work on the project. "While she credited the spirit with telling her to invent, she was adamant that he hadn't been in cahoots with her over *how* to do it: '*No spirit told me this... To every patent application I have taken the oath, unperjured: 'This is my invention. This I claim.'*"³⁸

Jones received seven patents in 1873, some co-patented with her cousin Leroy Cooley. In 1890 she founded the U.S. Women's Pure Food Vacuum Preserving Company which produced a line of lunch meats and rice and tapioca puddings using her canning methods. She herself put up most of the million dollars to capitalize the new company. Due to internal politics, Jones lost control of the company three years later, but the company continued successfully until the 1920s.

Mary Engle Pennington
Biochemist; Refrigeration, Food Storage and Shipping
United States
1872 - 1952

At the beginning of this century, fear of food poisoning was a common concern. Hundreds of people died and thousands became seriously ill each year from improperly stored foods such as eggs, chicken, fish, and milk bought at the local market.³⁹ Urban populations were growing and one of the challenges of the time was to develop ways to move food safely from the farm to the market.

More than any other person, Dr. Mary Engle Pennington was responsible for solving this dilemma.... Her design and construction concepts in refrigeration revolutionized the food industry. Her innovations in food transportation and storage as well as her research in frozen foods changed forever the way we eat.⁴⁰

Born in Nashville, Pennington's parents soon moved to Philadelphia. She showed an early interest in science, and attended the University of Pennsylvania, where she completed the requirements for a Bachelor of Science degree in two years. Because she was a woman, however, the university refused to grant her degree, giving her a "Certificate of Proficiency" instead. They did allow her to continue graduate studies, though, and awarded her a doctorate in 1895.

After post-graduate work in botany and physiological chemistry, Pennington opened her own company, the Philadelphia Clinical Laboratory, which specialized in bacteriological analyses. "Her work earned her an appointment as the head of the city health department's bacteriological laboratory, where her research into impure milk established health standards subsequently adopted throughout the country."⁴¹

When the U.S. Department of Agriculture needed someone to research refrigeration, a new food preservation process that showed promise but needed improvement, the department chief, a old friend of the Pennington family, called Mary. "Under his advice, she signed her 1907 civil service exam 'M.E. Pennington.' By the time most agricultural officials realized 'Mr. Pennington' was a woman, she had already become an indispensable member of the department and first chief of the U.S. Food Research Laboratory."⁴²

Pennington didn't actually invent refrigeration, but she made it workable. Like the atmosphere outside, air within a refrigerated locker would lose its ability to hold moisture as it approached freezing temperature. The result was dried-out food; yet, when humidity was increased, the food became moldy. Dr. Pennington solved the problem of humidity control.⁴³

"Her innovations in refrigeration were so vital during World War I that she was awarded a Notable Service Medal by President Hoover."⁴⁴

Pennington left the USDA for a job with a company that manufactured insulating materials. Three years later she started her own consulting firm, "advising packing houses, shippers, and warehousemen on food handling, storage, and transportation."⁴⁵ She also did original research on frozen foods.

Pennington's work resulted in the development of many new ways of preserving, shipping, and storing perishable foods.

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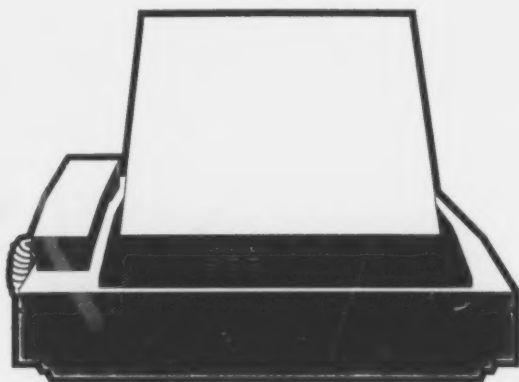
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¹⁶ Sondra Henry and Emily Taitz, *Written Out of History: Our Jewish Foremothers*

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Printing

Europe, 15th - 18th Centuries

The printing press in the West was developed around 1450 by Johann Gutenberg, a German silversmith. His press was a major innovation that did much to transform western society. Prior to the development of a press with moveable type, books were painstakingly reproduced by scribes. The preparation of a single copy of one book might take a skilled scribe several years. The slowness of the process meant that books were rare and precious items used primarily by religious scholars. In addition to religious scholars, literacy was limited to only a few members of the upper class.

In contrast, the process of setting type was about as difficult and painstaking as the work of the scribe. But once the type was set, it could be used to print hundreds of copies. Suddenly, books became more accessible to the average person. Information and ideas could be shared with many, instead of just a few. The church and state quickly realized that the press was a threat to their authority. As censorship grew, printing became a dangerous trade, and printers were imprisoned for publishing material that went against accepted doctrine. In England, the number of print shops was limited by law, and censorship was common until the development of the Declaration of Rights in 1689 and expiration of the Licensing Act in 1694.

The trade of printing is actually a collection of several related trades. Two – composition and bookbinding – quickly developed into high-status and well-paid trades. The compositor set and proof read the type, a process that demanded a high level of skill, including the ability to read the type upside down and backwards. The work of actually running the press was often considered too heavy for women, but there were women who, from the beginning, ran the press, set the type, and bound books.

One group that quickly embraced the new technology was the Jewish people. Because of the value placed on learning and religious scholarship in Jewish religion and culture, "books and the reproduction of books have always been important to the Jewish people.... Some of the earliest presses were founded for the printing of Hebrew books."¹ One of the first women printers was Estellina Conant, who lived in Mantua, Italy in the late 15th century. She was printing books in 1476, just twenty years after the invention of the printing press. A Hebrew word for printing had not even been invented until a year or more after she began working.

Estellina Conant was one of a long line of Jewish women in the printing trade. A catalog of all the typographers and printers of Jewish books until 1732 includes "many women, such as Bat Sheba of Verona (1594), Gutel Kohen of Prague (1627), and Rebecca and Rachel Judels of Wilmersdorf (1677). Most of them belong to families of typesetters, but some learned the craft by other means."²

As was common in those days, every family member was involved in the family trade. Even children started young, doing whatever they were capable of, and learning the trade. "Surely one of the treasures of the history of Jewish women must be a brief passage, written at the bottom of one page of a prayer book. The book, in Hebrew with a

Yiddish translation, was printed in Dessau in 1696. The writer of the passage is named Ella. In a few lines she states simply that she set the type for this translation. She is only nine years old and in view of her youth, she asks to be forgiven for any printer's errors."³

By the mid-sixteenth century, printing was well-established in many cities of Europe. Lyon, in France, was particularly known as a printing center. A number of women were involved in the Lyon printing trade, usually in the position of managing the business. In most cases, they were the widows or daughters of men who had been printers, and when they took over the business, published under their own names. Jeanne Giunta and Sibille de La Porte, who both inherited their publishing houses from their fathers, "are the closest we come in sixteenth-century Lyon to the high-level female entrepreneur."⁴

Other women worked closely with their husbands and continued to run the print shop in the absence or after the death of their husbands. For example, Louise Girad was a full partner with her husband in his printing shop. While he was in prison for heresy (remember the dangers of being a printer!) in 1542-44, thirteen books were published under his name, which suggests that Louise was capable of – and did more – than just minor tasks in the shop.

Another printer's widow, Mie Roybet, continued the print shop after her husband's death. She and a collaborator were briefly imprisoned in 1557 for having printed "certain books in the French language touching matters of the Christian Religion, without privilege and permission of the Faculty of Theology of Paris."⁵

Widows also inherited presses in Strasbourg and London in the sixteenth and seventeenth centuries. Margarethe Prüss, a Strasbourg widow, published radical religious tracts in her print shop. In London, women constituted nearly a tenth of the publishers in the mid-sixteenth to mid-seventeenth centuries.

England, 19th Century

By the beginning of the 19th century, compositors and bookbinders had become "labor aristocrats." Both trades were highly skilled and well-paid, and had been "strictly regulated since the sixteenth century by the powerful Stationers' Company (incorporated in 1555) which limited the number of presses and master printers in London."⁶

Printing and Composition

Since the late 17th century, the Stationers' Company had declared that master printers would be able to train only their legitimate sons in "this Art or Mystery of Printing." Although women had been working as compositors since the 15th century, by the early 19th century, none were working as compositors or at the press.⁷

From the late 17th through the early 19th centuries, the journeymen unionized, eventually forming the London Union of Compositors, which controlled a large part of the printing industry in London, and was instrumental in continuing the exclusion of women from the trade.

All of the printing trades underwent considerable change and reorganization between 1800 and 1918 due to the introduction of machines that broke the work down into smaller units requiring less skill. These changes brought women into parts of the trade that had been entirely male domains, and men into formerly female domains.

Some employers began hiring women for both hand and machine composing in about 1860, taking advantage of the custom of paying them about half the wages of men. The London Union resisted both the introduction of composing machines and women compositors, for both implied a loss of skill and status in the trade. Although women were being used to undercut the Union's rates, the Union refused to organize women, and instead battled the changes by insisting that its members not work with women or on any job in which women had been involved, and charging that women's work was inherently inferior to men's. Women were fast, they claimed, but inaccurate and could not do the heavy work. That criticism was apparently not shared by the employers in question, who continued to hire women and whose businesses managed quite well with female labor.

Two organizations concerned with working women decided that composition was a suitable trade for women, and began training and employment programs. The first project was the Victoria Press, founded by Emily Faithfull in 1860. "The Press employed and trained women compositors who worked an eight-hour day... By 1869 the Press was arousing a good deal of critical comment."⁸ The critics claimed that the women never composed any books without the aid of men, they were subject to "diseases dire" that afflict women who work hard, and that there were many skilled male compositors out of work.

In 1876 Emma Paterson, a former bookbinder's apprentice, founded the Women's Protective and Provident League (WPPL), which two years later founded the Women's Printing Society (WPS), a printing business.. The WPS was noteworthy in its intentions to provide "technical training for girls [for] good work ... [that] should be paid for at the ordinary trade rate, since it is not at all intended to introduce women into an unfair competition as regards wages, such as that to which workmen have hitherto naturally objected."⁹ Women at the WPS carried out every stage of composition. For reasons that are unclear, the WPS was a success, while the "Victoria Press ... aroused direct antagonism from the London Society of Compositors."¹⁰

Despite the efforts of the WPS and the Victoria Press, no real gains were made for women in the printing trade. The

compositors succeeded in retaining skill, status and wage levels in a process virtually unmatched in any other industry while women remained very much a despised minority in the trade. A printing census taken in 1888 found only four women printers to every 100 men. Work done by women was consistently abused as below the standards of men's. However, since the evidence for this view comes very largely from unions, assessment of its validity is hard to make. Certainly the Scottish printing trade appears to have operated entirely successfully with the help of a large contingent of women compositors.¹¹

For example, the Glasgow firm of Foulis and Son flourished about 1765. Foulis, a celebrated typographer, trained and employed his daughter, who was also highly skilled.¹²

Bookbinding

In the 19th century, bookbinding was a high status and respectable trade for women. Unlike printing and composition, the bookbinding trade had definite and well-defined places for women. Within the family workshop, women had performed the early stages of the binding process, including folding, collating, and sewing. By 1800 these roles were strictly defined by the Bookbinders' Trade Society, which recognized women's place in the trade, but did not admit them to membership. Women earned about 60 percent compared to men in similar work.

"Until the 1780s women workers as well as men had a well-established seven year apprenticeship system. Then the women's apprenticeship system began to break down and it gradually was replaced by a learner system."¹³ Learners were taught only part of the trade, and less reputable companies tended to rely entirely on learners, rather than the more skilled, and more expensive, journey-level workers. This shift began the inexorable process of reducing women's skill levels and opportunities for good wages in the bookbinding trade.

In the late 1800s, mechanization further subdivided the tasks involved in bookbinding, and actually increased the employment open to women. "They operated machines, including the casing machines, took on more collating and also began placing illustrations, laying gold on covers, head-banding and covering magazines."¹⁴ Male bookbinders began complaining about women taking over their jobs, but in reality, women were being relegated to newly defined positions that required less skill and offered less pay and status than men had received before mechanization. The result was that bookbinding became a female dominated trade. The "1888 census revealed 111 women for every 100 men."¹⁵ While women lost in skills, they gained in numbers of jobs and bookbinding remained a highly respectable trade for women.

American Colonies, 17th - 18th Centuries

Conditions were somewhat different in the American colonies. The printing trades were free from the rigid control of the London unions, and there wasn't a large enough population to create the fear of competition that led the European guilds and unions to restrict training and membership. Consequently, we find women printers in the colonies, some of whom learned the trade in their father's or husband's print shops, and others who appear to have served regular apprenticeships.¹⁶

Isaiah Thomas, a printer who worked after the American Revolution, provided an extensive listing of printers and printing activity in the American colonies including Canada, and the new United States in his book *The History of Printing in America*. Among the printers he listed were a number of women.

The first printing press in the Americas north of Mexico was owned by a woman, Elizabeth Glover Dunster. It was her first husband, the Rev. Joseph Glover, who

obtained the press and printing materials in England, and set sail for Massachusetts with his family in 1638. He died along the way, leaving the press to Elizabeth. The press was established in Cambridge. Elizabeth shortly married Henry Dunster, to whom she entrusted the management of the press. The actual printing was done by a printer hired by Rev. Glover in London.¹⁷

Although Elizabeth Glover Dunster's involvement in printing appears to have been peripheral, many other women later were directly involved in the management and production of print shops. "At the time of the Revolution, about a dozen women were owners of printing establishments."¹⁸ One writer noted that "even in the eighteenth century there were one or more women printers in eight different states – Massachusetts, Connecticut, Rhode Island, Pennsylvania, Maryland, Virginia, and South Carolina – and, further, that these women were both compositors and worked at the press."¹⁹

Other women were also involved in printing, although they did not own their own presses. For example, Elizabeth Bushell, daughter of Halifax printer John Bushell, "had been accustomed to assist her father in the printing house. She could work both at case and press; and was, in the language of printers, a swift and correct compositor."²⁰ Several of the daughters of Philadelphia printer John Humphreys, Jr., "were good compositors, and often worked at case."²¹ An observer noted that he had seen "in a printing house near Philadelphia, two women at the press, who could perform their week's work with as much fidelity as most of the journeymen."²² It was also said that the first wife of German-born Anthony Armbruster, a printer of books in the German language in Philadelphia in the mid-18th century, "was a good worker at press, and often assisted her husband in that employment."²³

Mary Katherine Goddard
Printer, Declaration of Independence
American Colonies
1738 - 1816

Mary Katherine Goddard came from a prominent printing family. In 1765, her mother Sarah Updike Goddard and her brother William started the *Providence Gazette* in Rhode Island. Later, William and Mary Katherine moved to Baltimore, where they purchased a print shop and started publishing the *Maryland Journal* and the *Baltimore Advertiser* in 1773. When William's time was taken up by a project to improve the federal postal system, Mary Katherine continued to operate the press alone. In 1776, she was selected by the Continental Congress to print the first official copies of the Declaration of Independence.²⁴

Isaiah Thomas wrote, "She was an expert and correct compositor of types, and ably conducted the printing house of her brother during the time he was engaged in other concerns. For a period of about eight years, the Journal and every work which issued from that press, were printed and published in her name, and partly on her account."²⁵ "She did some very good book printing, including fine work with copper plate."²⁶

In addition to printing, Mary Goddard also served as post mistress of Baltimore for 14 years, operated a bookstore, and owned and possibly managed a paper mill. After retiring from the press and postal service, she continued to operate the book store until 1802. "She was one of the few unmarried colonial women to achieve economic independence."²⁷

Anne Smith Franklin
Printer
American Colonies
1696 - 1793

Anne Franklin, the sister-in-law of Benjamin Franklin, took over the family business when her husband James, the first printer in Rhode Island, died in 1735. Anne Franklin was named state printer of Rhode Island in 1736, and the first piece bearing her name was *The Rhode-Island Almanack for the Year 1737*.

"She printed for the colony, supplied blanks for public offices, and published pamphlets, &c. In 1745, she printed for the government an edition of the laws, containing three hundred and forty pages folio. She was aided in her printing by her two daughters, and afterward by her son when he attained a competent age. Her daughters were correct and quick compositors at case; and were instructed by their father whom they assisted."²⁸

Anne Catharine Green
Printer
American Colonies
c. 1733 - 1775

Anne Catharine Green was born in Holland and came to America with her parents while she was a baby. She married Jonas Green, a printer, and had six sons and eight daughters.

When Jonas died in 1767, she took over the printing business. The next year her son William became her partner. The company was *Anne Catharine Green & Son*. William died two years later, and she continued the business alone in her own name. She printed for the colony and published the *Maryland Gazette*, which Jonas had started and managed for 22 years. It was the second newspaper published in the colony. Anne Green continued the newspaper from 1767 until her death in 1775. She was succeeded by two sons, who continued the paper.²⁹

United States, 19th Century

The success women experienced in the early days of the American colonies continued somewhat into the early 19th century. In fact, Harriet Martineau, writing in 1836, listed eight occupations open to women in this country; typesetting and bookbinding were among them.³⁰ Census records from 1840 show that "although the proportion of female printers was dropping, women formed the core of the bookbinding trades."³¹ Women worked in the trade as typesetters, press feeders, press tenders, and proof readers.

[I]n 1845 the New York Tribune reported that girls were employed on most of the power presses that run in book offices, as the labor on these machines was light. Again, in 1858, it was said that in Philadelphia, where power presses were in use in all the leading establishments, "many of the employees who tend presses are females..."

Women were not successfully employed as proof readers until long after they had been successfully employed as press feeders. About 1870 the proprietor of one of the largest publishing houses assured ... that he knew of no case of a woman acting as proof reader. Nevertheless, the Boston Stereotype Foundry reported that it employed three young ladies to read proof.... A woman was also employed as proof reader at the Bible House....³²

Not everyone was supportive of women entering the printing industry, and memories of women's prominence as printers in the previous century was apparently forgotten. "In 1830 the Boston Courier referred to the employment of women as printers in the 'establishments for book printing' of that city as 'an evil of recent growth.'"³³ Their concern was that as new technology simplified the tasks of the trade, women were replacing skilled journeymen at lower wages. They estimated that two or three hundred journeymen were out of work. The following year, the editor of another Boston paper estimated that "200 women were employed in printing in that city."³⁴ In contrast to the dismay expressed in Boston, "a Philadelphia paper frankly congratulated Bostonians on having found in female labor the means of cheapening the cost of composition in printing."³⁵

As in England, when male printers organized into unions, they excluded women. Furthermore,

the Boston Typographical Union in 1856 seriously considered discharging any member found working with female compositors. This feeling of enmity was revived from time to time when women were introduced into the trade as strike breakers, or were employed at a lower wage in competition with men.

1864 there were many instances of this use of women in Rochester, St. Louis, Chicago, Boston, and New York. It was reported that the Western Publishers' Association had established a "Typographical Female

Seminary" in Chicago, with facilities sufficient to teach at one time 40 women "in the art of setting type." The proprietor of one of the Chicago daily papers boasted that he "placed materials in remote rooms of the city and secretly instructed girls to set type, and kept them there until they became sufficiently proficient to enter the office, and thus enabled the employer to take a "snap judgment" on his journeymen. There can be no doubt that many strikes were thus lost by the printers' union through the introduction of female compositors."³⁶

Unlike their English counterparts, however, the American unions realized that women were a greater threat outside the union than if they were union members. In New York, the Typographical Union No. 6 assisted with the formation of the Women's Typographical Union No. 1. Likewise, the printers' unions in St. Louis and Rochester suggested that the women organize themselves and adopt the union scale of prices. The Women's Typographical Union No. 1 did adopt the union scale. The first president, Augusta Lewis, who

was eager to unite with male typographers, accepted an invitation to merger her union of women into the male organization, Typographical Union No. 6. There she was quickly disillusioned. While the women respected the men's strikes and refused to undercut their price, the men denied women any job assignments at all. "We have never," Lewis declared after a year's experience, "obtained a situation that we could not have obtained had we never heard of a Union."³⁷

Nevertheless, women were beginning to apply for membership in printing unions around the country, and were gradually accepted into membership.

The United States also saw feminist employment projects that focused on printing. Amelia Bloomer, a women's rights activist, founded *The Lily*, a feminist journal in 1849. "Bloomer and Ella Wentworth, editor of a literary journal in Cincinnati, both employed women in presswork as well as in writing and editing."³⁸ Annie E. MacDowell

started in Philadelphia the *Woman's Advocate*, all the work on which, including the typesetting, was done by women. Not being able to find a male printer in Philadelphia who was willing to instruct a woman, she is said to have imported one from Boston. A writer ... who signed himself Ned Buntline, states that ... when he published a paper in Philadelphia, he had "hired women compositors from her office, at full union men's wages, and they did their work well and promptly."³⁹

In the latter part of the 19th century, women in the West found work in the printing industry. In 1868, a Woman's Cooperative Printing Union was established in San Francisco, "to give women employment as typesetters and thereby enable them to earn an independent and honest living and to conduct and carry on a general printing business." By the end of the century, "1,238 women were engaged in printing and publication, and

another 1,127 were employed as compositors, linotype operators, and typesetters in eleven far-western states. [There were also] twenty-five women newspapers owners and editors in Missouri in the same period."⁴⁰

In Canada the census of 1871 showed that women accounted for only 17 percent of the labor force in printing establishments, and they were concentrated in bookbinding. "James Campbell's Toronto publishing business reported 90 women among its total workforce of 126; other large enterprises in this line such as Hunter Rose and A. Dredge & Co. of Toronto and John Lovell of Montreal had similar female proportions. Women and girls made up nearly half the labour in Canada's only bank note engraving establishment, Smilies Bourne & Co. of Ottawa."⁴¹

Sarah Hillhouse Porter

Printer, Farmer, Businesswoman
United States
1763 - 1831

One woman printer in the early 19th century was Sarah Porter Hillhouse of Washington, Georgia, who took over her husband's print shop after his death in 1803. For the next seven or eight years she published and edited *The Monitor*. "For a time, the Journal of the Georgia House of Representatives was printed in her shop, and a local historian calls her the first state printer as well as the first woman editor of Georgia." In addition to the print shop, she also took over her husband's farm and general store, and was reported to have handled all the businesses "capably."⁴² She had a son, who took over *The Monitor* in 1810 or 1811, and two daughters.

Lydia R. Bailey

Printer
United States
1780s - 1869

Lydia Bailey was another woman who made success out of misfortune. Her husband, a printer, "died in 1808, leaving his young widow nothing but debts and the care of four small children." She carried on her husband's printing business. "Her father-in-law, also a printer, turned some business to her, and retired in her favor in 1815. She did good work and she prospered. From 1830-1850 she was printer to the city of Philadelphia. During the later part of her life she had the aid of a son, and after his death in 1861 she retired, but she was then over eighty years old."⁴³

Augusta Lewis
Typographer, Union Organizer
United States
1869

Augusta Lewis made her mark in history by organizing a group of women typographers in New York City in 1868, forming the Women's Typographical Union No. 1. She was elected the first president. By "January of 1869, this union numbered among its members over 30 of the best women compositors in New York City, and before the end of the year had \$400 in the treasury."⁴⁴ The Union set up "a cooperative printing establishment, ... which succeeded in maintaining rates and distributing profits for more than a year."⁴⁵

Lewis was also involved in the Working Women's Association, founded by Susan B. Anthony in 1868.

In contrast to most helping groups whose main interest lay in preserving family life, the object of the WWA was the amelioration of working conditions and elevation of those who worked for a living.

From the beginning, the suffragists, middle-class non-wage-earners for the most part, believed that the ballot was essential to this end. And from the beginning the wage earners in the group expressed their sense that there were other causes besides the lack of the vote for the degradation of female wage earners. Augusta Lewis, already a moving force among New York's female typographers, articulated two such causes at the Association's second meeting in 1868. Women's lack of skills and men's need to support families, she argued, accounted for differential pay to men and women. Like her colleagues who had voted to take the word suffrage out of the Association's name, she refused to make the struggle for the ballot a priority.⁴⁶

In 1869, the Women's Typographical Union No. 1 was granted a charter by the International Typographers Union of North America. The following year, Lewis was one of two delegates representing the WTU at the International Typographical Union convention. She "was elected corresponding secretary of the international union, and served in that position with unusual ability and tact. This is the only time in the history of the organization that a woman has held a national office [as of 1911]."⁴⁷

United States: 20th Century

A survey of women's employment trends revealed that the number of women in printing trades grew rapidly between 1870 and 1910. In 1870, women were less than eight percent of all workers in the printing trades. By 1910, they constituted 20 percent.

Most of the growth was due to the subdivision of skills brought about by mechanization.⁴⁸

While specialization was the trend throughout the country, a 1907 study of women in the trades in Pittsburgh showed that the picture was somewhat different there:

The work of women in pressrooms and binderies differs, as the trade itself differs, from that in other cities. The smallness of the establishments and the development of the industry to meet local needs, has interfered with specialization. Few of the employees are kept continuously at one occupation. Two-thirds of them are "miscellaneous workers," which includes occasional press work, hand folding, wire stitching, sewing, gathering, collating, feeding the ruling machines, punching, perforating, round cornering and sometimes indexing. A small number have regular work at one occupation such as compositing or steady press feeding. So far as could be learned, Pittsburgh had eight women compositors in 1907. Three of them are old hands who "set up" side by side with the men, and whose employment dates from the days when the shop, now one of the largest in the city, was small. Others work at linotypes, which are operated like typewriters and at the press of a key drop the die which gives character to the warm type metal. The hand work in this latter shop is done by men, but the manager prefers women for the machines on the grounds that they are more dependable.

Press feeding is a field of work contested by men and women. Some firms employ men or women indifferently at both job and cylinder presses. In smaller establishments, where no girls are employed, it is claimed that boys are more useful, because they can "set up," and help in other ways. Boys are apprenticed to learn the trade, but girls never go beyond press work and are apt to leave in a few years, so the managers feel it is not worth while to teach them. On the other hand, boy press feeders are paid \$1.00 to \$3.00 a week more, and the employment of girls means a saving to the larger shops. When a girl becomes a press feeder she tends to stay in the industry as long as she works rather than to change to some other where the way of the machine would have to be learned anew.⁴⁹

Between 1910 and 1940, the number of women dropped again, to about 12 percent of the total in the trade. Most women worked as operatives, especially in bindery work. These jobs had one-year apprenticeships, as opposed to six years for skilled trades like compositor and typesetter. Even though the amount of printed material increased astronomically in those years, the numbers of typesetters and compositors declined due to mechanization. Women compositors were the only ones affected at first, but men were affected later and to a lesser extent. By 1940 women were less than 5 percent of the compositors and typesetters.⁵⁰

In the 1920s and 1930s, printing was one of the primary industries hiring African-American women. Most of the jobs were unskilled, low paid, and not unionized.

Women printers were affected by the introduction of protective legislation in the early decades of the century. These laws were intended to improve the conditions of women in the workplace. First, the National Consumer's League pushed for limiting women to ten hour workdays. While some were concerned that women would lose work to men who weren't limited to ten hours, their fears were unfounded. Quite the opposite, the limitation resulted in an increase in the numbers of jobs available to women.

Trade unions were among those lobbying for the restrictions. While it appeared on the surface that trade unionists and women's work reformers shared the same agenda, some women workers were skeptical.

Women's Party activist Jane Norman Smith claimed, for example, that trade unionists acknowledged openly that in public "we must talk about 'humanitarian' laws for women and that sort of sob stuff, but when we get into committee, we just come right down to brass tacks and say to the men, "We had better drive the women out of the trade as fast as possible, and the quickest way to do it is through a special 8-hour law for women."⁵¹

Another form of protective legislation negatively affected women's employment opportunities. The Women's Bureau of the U.S. Department of Labor studied the effects of night work on women, and found that it was injurious to their health and the welfare of their families, mainly due to lack of sleep. In 1919 New York State passed legislation prohibiting night work for most women (singers, actors, and cloakroom attendants were exempt from the restriction). Women printers were hard hit by the legislation because morning newspapers, which required night work, outnumbered evening editions. They protested, but lost their jobs. The women continued to lobby, and finally the law was repealed in 1921. The number of women printers on night shifts increased markedly.

¹ Sondra Henry and Emily Taitz, *Written Out of History: Our Jewish Foremothers* (Fresh Meadows, NY: Biblio Press, 1983), 114, 117.

² Henry, 118.

³ Henry, 119.

⁴ Natalie Zemon Davis, "Women in the Crafts in Sixteenth-Century Lyon," in *Women and Work in Preindustrial Europe*, Barbara A. Hanawalt (Bloomington, IN: Indiana University Press, 1986), 185.

⁵ Davis, 184.

⁶ Felicity Hunt, "Opportunities Lost and Gained: Mechanization and Women's Work in the London Bookbinding and Printing Trades," in *Unequal Opportunities: Women's Employment in England 1800-1918*, Angela John (New York: Basil Blackwell, Ltd., 1986), 72.

⁷ Hunt, 72.

- ⁸ Hunt, 80.
- ⁹ Hunt, 80.
- ¹⁰ Hunt, 81.
- ¹¹ Hunt, 85.
- ¹² Isaiah Thomas, *The History of Printing in America* (1810; reprint, New York: Weathervane Books, 1970), 592.
- ¹³ Hunt, 74.
- ¹⁴ Hunt, 84.
- ¹⁵ Hunt, 86.
- ¹⁶ Alice Kessler-Harris, *Out to Work: A History of Wage-Earning Women in the United States* (New York: Oxford University Press, 1982), 14.
- ¹⁷ Thomas, 43-45.
- ¹⁸ Linda Grant De Pauw, *Founding Mothers: Women of America in the Revolutionary Era* (Boston: Houghton Mifflin, 1975), 34.
- ¹⁹ Helen L. Sumner, *History of Women in Industry in the United States* (New York: Arno Press, 1974), 212.
- ²⁰ Thomas, 592.
- ²¹ Thomas, 399.
- ²² Thomas, 592.
- ²³ Thomas, 383.
- ²⁴ De Pauw, 35.
- ²⁵ Thomas, 540.
- ²⁶ Elizabeth Anthony Dexter, *Career Women of America: 1776-1840* (Cambridge, MA: Marshall Jones Co., 1984), 104.
- ²⁷ De Pauw, p. 35.
- ²⁸ Thomas, 315.
- ²⁹ Thomas, 532, 542.
- ³⁰ Sumner, 17. The other occupations were teaching, needlework, keeping boarders, work in mills, shoe binding, and domestic service. "But in the same year the committee of the National Trades' Union, which was appointed to inquire into the evils of female labor, reported that in the New England States, 'printing, saddling, brush making, tailoring, whip making, and many other trades are in a certain measure governed by females,' and added that of the 58 societies composing the Trades' Union of Philadelphia 24 were seriously affected by female labor.' "
- ³¹ Alice Kessler-Harris, *Out to Work: A History of Wage-Earning Women in the United States* (New York: Oxford University Press, 1982), 48.
- ³² Sumner, 212-13.
- ³³ Sumner, 213.
- ³⁴ Sumner, 213.
- ³⁵ Sumner, 214.
- ³⁶ Andrews, 104.
- ³⁷ Kessler-Harris, 82.
- ³⁸ Sandra L. Myres, *Westering Women and the Frontier Experience 1800-1915* (Albuquerque, NM: University of New Mexico Press, 1982), 264.
- ³⁹ Sumner, 215.

- ⁴⁰ Myres, 265.
- ⁴¹ Elizabeth Bloomfield and G. T. Bloomfield, *Canadian Women in Workshops, Mills, and Factories: The Evidence of the 1871 Census Manuscripts* (Guelph, Ontario: University of Guelph, 1991), 66.
- ⁴² Dexter, 103.
- ⁴³ Dexter, 107.
- ⁴⁴ John B. Andrews and W.D.P. Bliss, *History of Women in Trade Unions* (1911; reprint, New York: Arno Press, 1974), 104.
- ⁴⁵ Kessler-Harris, 82.
- ⁴⁶ Kessler-Harris, 95.
- ⁴⁷ Andrews, 105.
- ⁴⁸ Janet M. Hooks, *Women's Occupations Through Seven Decades* (Women's Bureau Bulletin No. 218) (Washington, DC: U.S. Government Printing Office, 1947).
- ⁴⁹ Elizabeth Beardsley Butler, *Women and the Trades: Pittsburgh, 1907-1908* (Pittsburgh: University of Pittsburgh, 1984), 276-77.
- ⁵⁰ Hooks.
- ⁵¹ Kessler-Harris, 203.



Miscellaneous Industries

Paper Manufacture

Paper was first manufactured in China in the second century using native fibers such as mulberry or bamboo. The process was imported to Japan in the seventh century. The first paper manufactured in Europe was a rag sheet consisting mainly of linen fibers, produced in Játiva, Spain, in 1085. The process slowly spread through Europe from there, showing up next in Italy in the late thirteenth century.¹

By the eighteenth century in both England and the American colonies, women were commonly employed in paper mills, where they were engaged in the heavy and tedious work of sorting and cutting rags.² A few women also owned paper mills. In February, 1788, Ann Dickenson of Philadelphia advertised that she would continue her late husband's business of manufacturing wall paper and that she had on hand "some of the newest patterns, and some never before exposed."³

Machine production of paper was introduced to the United States in 1827. That, combined with the development of a process for extracting cellulose from wood in the 1860s, created a rapidly growing market for low-cost paper products. Because the products were light weight and the machine operation required dexterity, women and girls were often employed in the new paper factories. The proportion of women working as "operatives and laborers in paper and paper products industries – pulp, paper, and paperboard mills, paperboard containers and boxes and miscellaneous paper and pulp products" increased steadily through the 1890s, and leveled off by 1920 at about 25 percent.⁴

In 1863, Rebecca Sherwood patented a process for creating paper out of straw pulp. Anne Macdonald, in *Feminine Ingenuity*, related the story of Sherwood's fight to get her patent:

With [Civil] wartime shortages of materials, Sherwood's invention for reducing straw to pulp and then substituting it for wood pulp might well have been applauded, but when she asked her husband to run tests of it at the local mill where he worked, his fellow workers gathered around to guffaw and jeer that no *woman* could improve upon their methods. The Sherwoods accepted the ribbing; but when the mill owner himself tried to patent a suspiciously similar process, the combative Rebecca Sherwood slapped him with an "interference" suit and, in the testimony assembled for the case, thus preserved for posterity the steps in her invention's incubation.

After the mill owner's attorney repeatedly referred to the patent application for her "so-called" invention as being so "exceedingly vague that [it] baffles all ingenuity," he called for some show of "reliable evidence." Sherwood produced it. She told how she, the inventive housewife, converted her clothes boiler to hold a steaming cauldron of "a pretty strong soapy solution" in which she boiled straw until it was pulpy

enough to substitute for wood pulp. *And* she had witnesses! A gaggle of neighbors backed her up, supplying specific dates and descriptions of unusual kitchen commotion.... Another witness told how Sherwood had inadvertently dropped a piece of straw into her wash and found that it turned white and pulpy. All she had to do was try to duplicate the process.... Providentially, Sherwood had preserved those pulp samples she showed disbelieving friends ("some in small sheets and pieces – balls like – and some in boxes with other specimens") and produced them as *prima facie* exhibits for the patent examiners. She won her case, and her straw pulp samples still remain in a National Archives file, though there are no records of her having sold the rights to the process.⁵

The Canadian Census of 1871 revealed that paper producers frequently hired women. At the second largest paper mill in Canada, nearly half the workers were female. In addition, "women and girls tended to outnumber male workers in the small number of urban business that made products such as envelopes, wallpapers, and paper bags, boxes and collars."⁶

In 1940, women constituted about 14 percent of the workers in the United States paper industry overall. In paper manufacture, they worked mainly at rag sorting, counting, and finishing. They were about 50 percent of the workers in the production of paperboard containers and boxes.⁷

Pottery

The making of pottery is one of the oldest crafts known to humankind, and one of the most lasting. Because pottery is often among of the best-preserved items at an archaeological site, it is one of the first things archaeologists refer to when describing a site, period, or culture. According to Margaret Ehrenberg,

It was probably invented in south-west Asia, in the same areas in which farming was first practiced, but probably several hundred years after the people had become accustomed to a sedentary lifestyle. As pottery was probably used initially for storing cereals, or for cooking food plants, both of which were within the women's sphere of activity, women are more likely than men to have discovered the processes of molding clay and then firing it.⁸

Some of the earliest pottery has been found in the ruins of the Anatolian city of Catal Huyuk, dating from about 7000 BCE.⁹ Minoan Crete (3000-1500 BCE) was famous for its pottery throughout the ancient world, especially after the introduction of the potter's wheel around 2000 BCE. Ruby Rohrlach-Leavitt notes, "there is no evidence that men took over the craft with the introduction of the wheel; indeed, a statue of a woman potter dates from this period."¹⁰

One writer on ancient African cultures commented also that women were responsible for the development of pottery, and that pottery was primarily a female occupation.¹¹ In many parts of Africa today, women continue to be the potters.

The modern manufacture of pottery can be separated into two groups: industrial and craft. Industrial pottery manufactures china and stoneware for household, industrial, and medical use. In some parts of England, such as Devon in the last two centuries, women found industrial work in the china industry, particularly in the dressing sheds.¹² In Europe and the United States, women have traditionally worked in "finishing operations, decorating, dipping, grinding and polishing, and other occupations in this industry, even to some extent in firing, particularly on the smaller ware."¹³ The numbers of women in the pottery industry steadily increased between 1870 and 1940, and the proportion of women in the industry came close to one-third.

A related field that offered employment to women was china painting. In the nineteenth century, it provided a number of women with modest incomes. The field was also one that offered considerable opportunities to women with the technical knowledge of chemistry and mechanics and creative talent. The late 1800s saw a number of patents awarded to women for their inventions in glaze chemistry and firing kilns.

The first major woman potter of the period was Susan Stuart Frackelton, who had some art school training but was largely self-taught. She mixed her own clay and designed, patented, and marketed her own portable gas-fired kiln. She began her career in 1874, and exhibited her work through the end of the century. She started her own successful china coloring and decorating business, and a writer for *Success* magazine called her "a notable example of feminine genius."¹⁴

Two other women, Ellen M. Ford and Nancy M. Fitch, also received patents for pottery kilns in the 1880s.

Glass

Women worked as glass makers¹⁵ and glaziers in the seventeenth and eighteenth centuries. In 1787, the Bristol (England) workhouse records show that a woman named Sarah Lewis was paid 9 pounds, 1 shilling for glazing.¹⁶ In Pennsylvania, a woman who was possibly a refugee from the French Revolution, ran this ad in 1795:

Glass Engraver. Mrs. Decamps from Paris, informs the Public, that she has just opened her store, north Third street, No. 95, where she engraves with borders, flowers, garlands, cyphers, figures, escutcheons, &c., in the most elegant, fashionable, neat and new style – all sorts of glasses and glass wares, on the most reasonable terms. All orders will be thankfully received and punctually executed.¹⁷

Mary Tillinghast was a talented young woman who began her career in the field of needlework, then later "turned her talents to designing stained-glass windows. Her window *Jacob's Dream*, in Grace Church, New York City, was the first one to have been

set by a woman, and she was also well-known for her design and supervision of the complete interior of Saint Stephen's Church in Pittsfield, Massachusetts, including the altar, pulpit, and five stained-glass windows."¹⁸

The glass manufacturing industry remained the domain of the skilled glassblower until well into the twentieth century. As of 1870, women were only 1.8 per cent of all workers in the industry, where they typically worked in finishing, inspecting, and packing, although some women had been employed in painting glass since 1832.¹⁹

With the development of optical and scientific glass, and the introduction of safety glass, the use of which was mandatory in cars after 1930, opportunities for women in the glass industry increased. By 1940, women were nearly one-fifth of the industrial glass work force.²⁰

Katharine B. Blodgett

Scientist, Invented Nonreflecting Glass

United States

c. 1898 - 1979

In 1938, General Electric announced that one of its researchers had discovered a process for making nonreflecting glass. The glass is now used in a wide range of optical products, such as camera lenses, picture frames, range finders, telescopes, eyeglasses, and projecting lenses. The *New York Times* "gave it the ultimate accolade for the period – that *Gone With the Wind* had given even greater pleasure to millions of viewers because it was projected on theater screens through lenses made of nonreflecting glass."²¹

Katharine B. Blodgett, the researcher responsible for the development of nonreflecting glass, was the first woman scientist hired at the General Electric Research Laboratory. She was assigned to assist prominent physicist Dr. Irving Langmuir, who called her "a gifted experimenter with a rare combination of theoretical and practical ability."²² He set her to work on researching the properties of oily films that spread out on water in a layer just one molecule thick. The film reduced glare on water, and Blodgett developed a way to transfer it to glass, building it up in single-molecule thick layers. "Finally, by selecting the exact thickness needed to neutralize light rays reflecting from the glass, she found a way to create 'invisible glass' ... glass coated with a film that reduced the reflections (and thus the glare) from its surface."²³

Blodgett's next task was to find a way to measure the thickness of the film on the glass. She discovered that each layer reflected a slightly different color, which could be used as a gauge for determining the layer thickness. These layers were so thin that a pile of thirty-five thousand of them would be no thicker than a sheet of paper.²⁴

The applications of this film were diverse. Military uses developed in wartime included coating periscope and aerial camera lenses to increase their efficiency, coating aircraft wings to speed de-icing; adding it to smoke screens to make them more impenetrable.²⁵ The measuring gauge found uses in chemistry, biochemistry, physics, and metallurgy.

Blodgett continued her research on the film until her retirement in 1963.

Brickmaking

Women in ancient Greece and Rome worked in family brickmaking businesses.²⁶ In the ruins of Pompeii, "women's names stamped on ... bricks also record their involvement with building activities – from the ownership of a brickmaking or stonecutting operation by an upper-class woman to actual participation in the making of building materials and construction work by working women of the lower classes."²⁷ Grave inscriptions also testify to women's occupations as brickmakers.²⁸

Working women in eighteenth century England were often employed in jobs requiring heavy and strenuous labor, such as laboring in brickyards and lime kilns.²⁹ In the brickyards, girls as young as eight or ten carried several tons of cold, wet clay each day to the benches where women molded it into bricks. Each molder made about 2,000 bricks in a day.³⁰ Women laborers in lime kilns carried baskets of chalk on their head and shoulders, from the wall where the chalk was hewn, to the kiln.³¹

Although it was commonly accepted that women were capable of heavy physical labor in the eighteenth century, attitudes were different in the nineteenth. Women in the United States did not exceed more than a small percentage of the work force. Due to the heavy materials involved in the industry, it was considered unsuitable for women. In 1870, only 80 women worked in the brick industry, less than 0.3 percent of the work force. By 1940, the number had increased to over 2,000, almost four per cent.

The 1871 Canadian Census reported that "few women or girls labored in brick or lime kilns, but 47 establishments in the non-metallic minerals sector reported some female labor, especially in Quebec... Four women and three girls were employed by W. & D. Bell in making drainage tiles and pipes just outside Quebec City."³²

Several women owned brickyards, including Widow Richardson in Montreal, Elizabeth Stone of Fort Collins, and Sara Cockrell of Dallas.

An innovative new brick design was patented by Mary Nolan in 1876. Her bricks were designed to interlock and create uniform interior and exterior wall surfaces requiring no wall covering. The bricks were also hollow to provide both insulation and ventilation. One reporter predicted that "Nolan's interlocking bricks would halve building expenses and revolutionize building."³³ Unfortunately for Nolan, others saw models of her brick, and recognizing the potential, stole her not-yet patented idea.

The Pueblo peoples of the American Southwest built their homes out of adobe bricks. In many tribes, brickmaking was the responsibility of the women.

Straw

Straw bonnets were fashion essentials in the early 1800s, and at first most were imported. Several women, working independently of each other, invented processes that created a huge straw industry in the United States.

The straw industry got its start from 12-year old Betsy Metcalf of Dedham, Massachusetts, who, in 1795, made the first straw hat manufactured in the United States. Metcalf was too shy to apply for a patent, but she taught her technique to everyone who asked. "Women poured in from nearby towns to learn this technique for making bonnets that sold for half the price of imported ones."³⁴

The fad was on: children straw-plaited at school, sewing circles converted to braiding bees, and braiding almost edged out knitting and crocheting as women toted bonnets along with butter and eggs to exchange for other articles at village markets. So many women were engaged in the business of cutting, boiling, dyeing, flattening, splitting, braiding, and bleaching that many New England towns were known as "straw towns."³⁵

Mary Kies of South Killingly, Connecticut, was the first woman to receive an American patent. Her "new and useful improvement in weaving straw with silk or thread" was patented in 1809, just when the federal government had embargoed imports of goods from Europe, and President Madison's administration was eager to develop local industry. "During the War of 1812, the hat industry would be one of the few that continued to prosper, while other industries foundered so badly that most of the New England states were on the brink of secession when the war ended."³⁶

A third woman, Sophia Woodhouse of Wethersfield, Connecticut, contributed further to the burgeoning industry in 1821 by patenting a method for using native grass for straw.

By the 1830s, thousands of women and children were making straw bonnets in home-based businesses. Gradually the industry moved into factories, where both the bonnets and silk for linings were woven, and new machines took over some of the work women had previously done by hand.³⁷

¹ Isaiah Thomas, *The History of Printing in America* (1810; reprint, New York: Weathervane Books, 1970), 12-13.

² Ivy Pinchbeck, *Women Workers and the Industrial Revolution, 1760 - 1850* (1930; reprint, London: Frank Cass and Co., Ltd., 1977), 2.

³ Elisabeth Anthony Dexter, *Career Women of America: 1776-1840* (Francestown, NH: Marshall Jones Co., 1950), 148.

⁴ Janet M. Hooks, *Women's Occupations Through Seven Decades* (*Women's Bureau Bulletin No. 218*) (Washington, D.C.: U.S. Government Printing Office, 1947), 119-20.

⁵ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 21-22.

⁶ Elizabeth Bloomfield and G.T. Bloomfield, *Canadian Women in Workshops, Mills, and*

- Factories: The Evidence of the 1871 Census Manuscript* (Guelph, Ontario: University of Guelph, 1991), 66.
- ⁷ Hooks, 120.
 - ⁸ Margaret Ehrenberg, *Women in Prehistory* (Norman: University of Oklahoma, 1989), 87-88.
 - ⁹ Ruby Rohrlich-Leavitt, "Women in Transition: Crete and Sumer," in *Becoming Visible: Women in European History*, Renate Bridenthal and Claudia Koonz, eds. (Boston: Houghton Mifflin Co., 1977), 39.
 - ¹⁰ Rohrlich-Leavitt, in Bridenthal, 48.
 - ¹¹ Heinrich Loth, *Woman in Ancient Africa* (Westport, CT: Lawrence Hill & Co., 1987), 108.
 - ¹² Pinchbeck, 255.
 - ¹³ Hooks, 128.
 - ¹⁴ Macdonald, 131.
 - ¹⁵ Ann Oakley, *Woman's Work: The Housewife, Past and Present* (New York: Vintage Books, 1974), 20.
 - ¹⁶ Pinchbeck, 286.
 - ¹⁷ Dexter, 149.
 - ¹⁸ Macdonald, 197.
 - ¹⁹ Hooks, 126.
 - ²⁰ Hooks, 127.
 - ²¹ Macdonald, 318.
 - ²² Macdonald, 309.
 - ²³ Macdonald, 310.
 - ²⁴ Macdonald, 311.
 - ²⁵ Macdonald, 321.
 - ²⁶ Gillian Clark, *Women in the Ancient World* (New York: Oxford University Press, 1989), 11.
 - ²⁷ Sarah B. Pomeroy, *Goddesses, Whores, Wives, and Slaves: Women in Classical Antiquity* (New York: Schocken Books, 1975),
 - ²⁸ Mary Kinnear, *Daughters of Time: Women in the Western Tradition* (Ann Arbor: University of Michigan Press, 1982), 46.
 - ²⁹ Pinchbeck, 2.
 - ³⁰ Michael Hiley, *Victorian Working Women: Portraits from Life* (Boston: David R. Godine, Publisher, 1980), 54-55.
 - ³¹ Bridgit Hill, *Eighteenth Century Women: An Anthology* (London: George Allen & Unwin, 1984), 218.
 - ³² Bloomfield, 66.
 - ³³ Macdonald, 96.
 - ³⁴ Barbara Mayer Wertheimer, *We Were There: The Story of Working Women in America* (New York: Pantheon Books, 1977), 90.
 - ³⁵ Macdonald, 5-6.
 - ³⁶ Macdonald, 6.
 - ³⁷ Wertheimer, 90-91.



CONSTRUCTION



Construction Trades

Ancient

Women were involved in construction in a variety of ways in the ancient civilizations of the Near East and Europe. For example, "Queen Semiramis of Assyria is said to have invented canals, bridges and causeways. According to Greek historians, she supervised construction of the Hanging Gardens of Babylon,"¹ which were one of the seven wonders of the ancient world.

Recent excavations in Egypt at the pyramids of Giza have uncovered a cemetery containing both male and female skeletons. Damage to the skeletons' spines indicate that they worked on the pyramids, which involved heavy labor. The fact that they were buried on the site indicates that they were not slaves.²

It appears that every Egyptian was liable for temporary state labor or corvée duty, which might involve working in the state-owned fields or on construction projects. In one text, a man bemoans the fact that "his daughter is in the dyke" and the translator comments that the daughter "is presumably doing some rough work at the dam."³ Apparently women did work in heavy construction, but the "whole tenor of the text makes it clear that such an occupation for a girl lacked status."⁴

Some women in ancient Rome and Pompeii, in the 1st century BC, were involved in building trades. Sarah Pomeroy notes that

women's names stamped on pipes and bricks ... record their involvement with building activities – from the ownership of a brickmaking or stonecutting operation by an upper-class woman to actual participation in the making of building materials and construction work by working women of the lower classes.⁵

The Romans were quite proud of their plumbing, which consisted of lead pipes in their houses, and the craftsmanship of their *plumberi* was highly prized. It was a common practice for the plumber's name to be stamped on the pipes, and several sources mention casually that the name was usually a woman's.⁶ Unfortunately, additional information about these early women plumbers is lacking.

Europe to 1900

In the sixteenth century, the royal architect Philibert Delorme, the son of a Lyon mason, asked, "can anything be found which can employ and busy more people of either sex than building?... poor people, who otherwise would have to go beg for their bread?"⁷ And work they did. While it appears that women were excluded from the highly skilled building crafts guilds in medieval Europe,⁸ they worked widely as laborers and semi-skilled workers. In the fourteenth through sixteenth centuries, women

did heavy labor at the construction sites. Women carried stones, brought water for the mortar mixers, bunched thatch for roofs, collected moss and bracken to cushion the roof tiles of houses. Women carried sand for construction of the cathedral of Siena in 1336.... Women helped to build the college of Pérogoard in Toulouse, France, from 1365 to 1371, carrying stones and bricks, cleaning out latrines, and digging ditches. ⁹

Medieval women also did road work, and cut stone for repairing roads. ¹⁰

Women continued as construction laborers into the eighteenth century, when they worked as assistants to masons and bricklayers. ¹¹ There is also a court record from eighteenth century England of a woman who listed her occupation as plumber. ¹²

Foraging Societies

Margaret Ehrenberg, in *Women in Prehistory*, states that "the building of whatever shelters are used is often a woman's task in modern foraging societies." ¹³ In the twentieth century, this is still the case with the Mbuti pygmies of the northeast Congo. While they have no strict rules for the division of labor by sex, many tasks are divided in practice. Building the huts is one of the tasks commonly performed by women. ¹⁴

In several other twentieth century foraging societies, house building is a project that involves both sexes. Among the Bambara of West Africa, everyone works on the huts, but "only men perform the masonry work and only women gather water. Men plaster the outside and women the inside." ¹⁵ In the Amazon rain forest of Brazil, women of the Mundurucú make the floors of new houses, which involves carrying baskets of wet, heavy clay and spreading it down on the floor. They also carry the roofing thatch to the building site, but the men put the thatch in place. ¹⁶

Native American

In many Native American societies, it was the women who were responsible for the construction of housing. Jesuit priests in Labrador, Canada, in 1633 observed the women of the Montagnais-Naskapi tribe curing hides for lodge coverings and chopping down lodge poles in the forest. ¹⁷

At the same time, the Iroquois in upstate New York lived in villages of 2,000 or more. Women and men worked together to build large bark-shingled frame lodges that housed up to twenty-five families. ¹⁸

Many plains tribes lived in portable skin tents called tipis. It was the women who cured the hides for the tipi covering. According to Carolyn Niethammer,

when the tribe was on the move following the migrations of the buffalo, it was the woman's job to take down the tipi and pitch it again in a new location. The skin tent was so well-adapted to the nomadic life style that a

tipi could be struck and loaded, along with its furnishings and contents, in less than fifteen minutes. When a new camp had been decided on, two experienced women could raise a tipi and be ready for housekeeping in about an hour. Through continual practice a woman could estimate rather accurately just where she should pitch her tipi in the camp circle in relationship to the other tents. When the dwellings were too far apart there was danger from attack; when they were too close together the women didn't have enough room to work.¹⁹

The Hidatsa village dwellers of the northern Great Plains lived in winter and summer lodges that were built primarily by the women of the community, although the men participated in certain aspects of the project. The women cut wood into logs of varying lengths and transported them to the building site. The shorter logs were carried on a dog travois; the women carried longer logs on their backs. Four great central supporting posts were set in the building site. The posts were twelve to eighteen inches in diameter, depending on the size of the building, and about fourteen feet long or longer, and required twenty men to raise them into place. The posts supported four massive beams. The woman superintendent cut and dried the posts and beams the summer preceding construction.

Only a few women in the village possessed the right to superintend the trimming and raising of these four sacred foundation posts and the four great beams resting on these poles. Buffalobird-woman, who was one of the select few who had this privilege, had acquired it from her mother, paying her a suit of finely tanned skins for it. She claimed to have superintended, in the course of her lifetime, the building of ten earthlodges, eight of these the flat-topped variety, as well as the cutting and fitting of eleven skin and two duck tipis, making a total of twenty-eight dwellings, – not an inconsiderable accomplishment even for a long lifetime. Her prerogatives were recognized by the entire village and she was bound to perform this service for anyone requiring it, and, in turn, received a carefully dressed soft-tanned buffalo skin and a large wooden bowlful of meat and other food.²⁰

Once the posts and beams were in place, two women placed the 100 rafters. The roof was covered with bales of grass and sod, which was dug and placed by a team of women. The outside walls were banked in dirt as well, which women dug, transported and put into place.²¹

Pueblo dwellers in the Southwest built their multi-leveled complexes out of adobe. The women made "mud into brick and built adobes, replastering these mud houses every year."²² Mary Beard reported that "legend at least says that, when the San Xavier mission was being built for Spanish masters, Indian women subjects actually carried the stones for many miles and that for the sake of 'good medicine' they were careful not to let them touch the ground."²³

In the late nineteenth century, Fridjof Nansen observed the Greenland Eskimos living in winter houses built of stones and turf. The floors were dug below ground level and the top of the house rose four to six feet above ground. These structures, and the summer tents, were built by the women.²⁴

United States to 1900

Women worked in a wide variety of occupations during the colonial period. A record survives of a southern woman, Mary Stevenson, who was a glazier and painter.²⁵

African-American slave women did heavy construction labor. "As early as 1800, slave women made up half the diggers on South Carolina's Santee Canal. They helped build the Louisiana levees and worked on slave crews laying track for the Southern railroads."²⁶ Slave women who worked in the fields during the growing season worked on other projects, such as road repair and fence building, during the winter.²⁷

Women who participated in the settlement of the West found themselves doing things they would never have considered when they lived back east.

"I am a maid of all traids," one woman remarked in her diary in 1853. As had proven true on the trail, necessity blurred the relationship between men's and women's work. The tasks seemed endless. Women did heavy outside "male" chores, helping to dig cellars, to build cabins, "as there was no other man ... [Father] could get to help him."²⁸

Another woman recalled that "our house was made of logs, and the girls all helped with the construction of it. The cave we made ourselves, and were justly proud of the work, for no one in our neighborhood had a better one."²⁹

William Katz noted that "some women, born or married into rural families, grew to love frontier life. Eunice Russell Norris, an [African American] Colorado cowgirl, was so helpful in building the family log cabin and sawing stove wood, her father and grandfather affectionately called her 'son.'"³⁰ Many of these women took pride in their skills and accomplishments, and enjoyed planning and constructing improvements to their homes and farms.³¹

Some women became highly skilled at carpentry and woodworking. Esther Pariseau, best known as Mother Joseph and who is discussed in more detail under Architects, was a Quebec-born nun who learned carpentry as a child in her father's carriage shop. When she came West to her first assignment, "she built her own quarters with hammer and saw in 1856 and set about putting up the first Catholic school, mission, and orphanage in Vancouver, Washington."³² She became recognized as the northwest's first architect, designing a number of schools, hospitals, and missions. She often worked on site, supervising the construction of the buildings she designed. Up into her seventies, she was "climbing ladders to test beams and inspect the work."³³

Emily Warren Roebling
The Brooklyn Bridge
United States
1843 - 1903

One of the most fascinating – and enigmatic – stories about a woman in construction during the nineteenth century was Emily Warren Roebling and the Brooklyn Bridge. The Brooklyn Bridge has been called one of the wonders of the modern world.³⁴ The construction of the bridge was "full of drama and excitement. The sinking of caissons, the raising of great towers, the spinning of cables" – not to mention meddling trustees, crooked contractors, assorted scandals, and the mysterious engineer in charge – "all of this had the suspense and uncertainty of any good story, and Americans followed it avidly."³⁵

After John Roebling, the first engineer on the bridge, was killed in an accident on the construction site in 1869, he was succeeded by his son Washington. The younger Roebling superintended the construction from 1869 until its completion in 1883 – or did he? Many of his contemporaries were not so sure.

In 1871, while Roebling was supervising work in an underwater chamber called a caisson, he was stricken with "caisson disease," now known as the bends. He was crippled for life, and after 1872, never returned to the construction site. He remained in his house overlooking the site, where he is said to have watched and supervised the progress with binoculars from his window. His wife Emily became his chief assistant. Described as "a woman of tremendous fortitude and intelligence," Emily Roebling "took Roebling's correspondence, read all important documents to him, communicated in person with the board of directors and engineers, and provided Roebling with eyewitness accounts of the construction progress."³⁶ At a time when women were seldom – if ever – seen on construction sites except as guests, Emily Roebling made daily inspections of the work. Although one writer dismisses her as a "courier,"³⁷ another admits that "without her energy and reliability, Washington Roebling could not have continued on the project after 1872."³⁸ And despite the fact that Roebling was frequently in great pain and near death twice, work on the bridge continued without apparent interruption.

David McCullough describes the rumors that circulated about Emily's true role:

There would be all kinds of stories told about her later and the part she played, and quite a number of them were perfectly true. She did not, however, secretly take over as engineer of the bridge, as some accounts suggest and as was the gossip at the time.

But it is not at all surprising that the stories spread. As was apparent to everyone who met her, Emily Warren Roebling was a remarkable person. And since every piece of written communication from the house on Columbia Heights to the bridge offices was in her hand, there was, understandably, a strong suspicion that she was doing more than merely taking down what her husband dictated. At first she was credited

only with brushing up his English, which may have been the case. But by and by it was common gossip that hers was the real mind behind the great work and that the most monumental engineering triumph of the age was actually the doing of a *woman*, which as a general proposition was taken in some quarters to be both preposterous and calamitous. In truth she had by then a thorough grasp of the engineering involved. She had a quick and retentive mind, a natural gift for mathematics, and she had been a diligent student during the long years [her husband] had been incapacitated.

Trustees grumbled over her reputed influence. Newspapers made oblique references to it. And the fact that she had assumed such importance was often used as a basic premise for the argument that Roebling was not right in the head....

She had also become so adept at shielding her husband from visitors that many of them went away convinced she knew as much about the technical side of the bridge as any of the assistant engineers. When bridge officials or representatives for various contractors were told it would be acceptable for them to call at the Roebling house in Brooklyn, it was seldom if ever the Chief Engineer who received them. She would carry on the interview in his behalf, asking questions and answering theirs with perfect confidence and command of the facts. Most of them left quite satisfied that her husband would be correctly appraised of everything said. But so impressed were some that they went out the door convinced they had met with the Chief Engineer after all and their future correspondence would be addressed directly to her.³⁹

Emily Roebling attended the opening of the Brooklyn Bridge in 1883, walking "out front, leading the way, escorted by Mayor Buwell of Brooklyn and the new mayor of New York, William R. Gerace."⁴⁰

Emily Roebling died in 1903. Her husband, Washington, died in 1926, outliving her by twenty-three years.

In 1964 the bridge was officially declared a National Historic Landmark. It now carries more than 121,000 trucks and automobiles a day and on the average Sunday, in good weather, more than a thousand people go walking or bicycling on the promenade, which is still the only one of its kind. There are bronze plaques on both towers, beside the promenade, listing the names of John A. and Washington A. Roebling, the trustees, the assistant engineers, and the master mechanic. The plaques were put up when the bridge was first completed. In the time since, two more plaques, one for each tower, have been added to honor Emily Roebling.⁴¹

Women patented a number of construction and building related inventions in the late nineteenth and early twentieth centuries. Sarah E. Saul patented an improvement in

metallic casings for lead pipes in 1876. Ellen C. Demorest patented her invention of a floor for elevator shafts in 1882. Margaret Wilcox invented a combined stove and house heater, which she claimed could heat a ten room house and do all of the household's cooking for twenty four hours, using only 4 scuttlesful of coal.⁴² Wilcox also patented a combined clothes and dishwasher in 1890 and a radiator in 1893.

In 1919, Alice H. Parker received a patent for her energy-conserving gas heating system that heated only the desired rooms. Each room had its own temperature and air flow regulation controls. Ida Forbes patented an electric hot water heater in 1917.

Tabitha Babbitt
Inventor of the Circular Saw
United States
1779 - 1854

One of the most significant tool inventions in the construction industry was never patented by its inventor. Before the invention of the circular saw, all wood-based building construction was done by post and beam techniques. Dimension lumber, such as 2x4s, which made today's stick framing techniques possible, did not exist.

One day in the summer of 1812, Tabitha Babbitt of the Harvard Shaker Community was watching two of the brothers struggling with a two-man saw as she sat at her spinning wheel. She noticed that for all their effort, half of it was wasted with the return motion of the saw. She realized that if the saw blade could be made to travel continuously in the forward direction, timber could be cut more efficiently. She cut a piece of tin into a round saw blade, attached it to her spinning wheel, and tested it on a shingle.

Shortly thereafter, the Shakers built a large saw to her specifications at the Watervliet, New York, community. The new saw was found to allow one man and one boy to do as much work in one day as had previously been done by thirty men.⁴³

Babbitt is also credited with the invention of cut nails. "While watching the operations of making wrought nails, it occurred to her that they might be cut from a sheet of iron rolled to the right thickness. She told her idea to the smith; he tried it, and cut nails were the result."⁴⁴

In the practice of the Shakers, neither of Babbitt's inventions were patented. They were the gifts of a woman's creative genius that transformed the construction industry worldwide.

Twentieth Century

The Women's Bureau, in its report on women's occupational trends between 1870 and 1940, noted a rise in the numbers of women paperhangers and painters. Nearly 2,000 women were reported to be paperhangers in 1940, constituting just under 6 percent of the total. In the same year, women were reported to constitute less than 2 percent of all painters, with two-thirds of them working in factories and shops, and one-third in construction.⁴⁵

Responding to the need for affordable housing in 1913, Kate Gleason introduced the concept of applying mass-production methods like those of the automobile industry to housing construction.

In a time when all houses were custom built – as clothing was custom made before the advent of ready-to-wear – she built a one hundred house development called Concrest [in Rochester, NY], where each six-room house would provide small luxuries like a gas range, built-in bookcases, mirrors, and ironing boards – yet still remain affordable for working-class families.⁴⁶

Gleason built similar developments on France, California, and South Carolina, and became a wealthy and respected contractor.

Francis Gabe, who had grown up on construction sites with her contractor father, ran a building repair business for years. She liked fixing things, but her loathing of routine cleaning was the inspiration for her patented self-cleaning house. The house features a general cleaning, drying, heating and cooling apparatus in each room. In addition, all the surfaces of the house are washable and each room can be washed by pushing a few buttons. She also invented special appliances, such as the combination shower and washing machine for clothes, and a dishwasher that doubles as a cabinet. In all, she received 68 patents in 1984. The Inventors Workshop International wrote "once every few years, an individual inventor comes along whose innovativeness is so advanced, so prolific, and inspiring that we are compelled to give every aid, encouragement, and support it is within our power to do."⁴⁷ Gabe built and lived in a working version of the house in Newburg, Oregon.

In the twentieth century, women have worked in various capacities in construction throughout the world. At the turn of the century in the Galicia and Asturias regions of Spain, women often worked as construction laborers.⁴⁸ In India, "women construction workers declined in number, despite the growing utilization of female labor on public works projects.... Women on construction projects are disproportionately concentrated in the lowest-skilled and lowest-paid jobs (generally, that of carrying earth or bricks) with no chance of learning new skills."⁴⁹

In Hong Kong, women of the Hakka group over the age of 40 worked on construction sites, mainly as laborers carrying stones and other building materials.⁵⁰ Japan has a relatively high proportion of women labors in the construction sector. Accustomed

to hard physical work, many Japanese farm women work on road construction and other public works projects during the slack agricultural season.⁵¹

During the early years of the Soviet Union, it was generally accepted that women were capable of physical work. Stalin's first Five-Year Plan, introduced in 1928

had the aura of a military campaign. The slogan "Catch up to and surpass America!" implied that through struggle and sacrifice, Russians could realize their dream of universal prosperity. Despite a sharp drop in the standard of living, they were enthusiastic and believed the privation to be only temporary. In this atmosphere protective legislation was often ignored. Women filled the most arduous jobs: pulling, hauling, digging ditches, maintaining roads. Illiterate and semiskilled, they did not qualify for the most attractive positions. Many were simply drafted and sent to work in the wilderness without proper tools, shelters, and food. In four years, young workers, most of them girls, built over 1,500 industrial plants. Popular literature glorified the muscular heroines who could do anything a man could do: the idea of "woman's work" became obsolete.⁵²

With the advent of World War II, Russian women were urged to improve their skills, and they began entering skilled occupations. "In one year, 1941-1942, the percentage of women steam engine operators rose from 6 percent to 33 percent and similar dramatic increases occurred among tractor drivers, locomotive engineers, stream compressor operators, electricians, and welders – all highly paid occupations."⁵³

Reconstruction required all available resources after the war, and women remained in jobs as skilled workers. "But these women constituted a small proportion of the total female labor force; the overwhelming majority of women remained concentrated in the lower echelons of the economic ladder. They built the roads, dug the ditches, shoveled the snow, labored on the construction sites.... As late as the 1950s, women made up four-fifths of the unskilled laborers."⁵⁴

¹ Ethlie Ann Vare and Greg Ptacek, *Mothers of Invention: From the Bra to the Bomb: Forgotten Women and Their Unforgettable Ideas* (New York: Quill/William Morrow, 1987), 22.

² *Prime Time Live*, March 1, 1995.

³ Gay Robins, *Women in Ancient Egypt* (Cambridge: Harvard University Press, 1993), 122.

⁴ Robins, 122.

⁵ Sarah B. Pomeroy, *Goddesses, Whores, Wives, and Slaves: Women in Classical Antiquity* (New York: Schocken Books, 1975), 200.

⁶ Carol Pomerantz and Jim Olszynski, "History of Plumbing, Part 3," *Plumbing &*

Mechanical, July 1988, 44.

- ⁷ Natalie Zemon Davis, "Women in the Crafts in Sixteenth-Century Lyon," in *Women and Work in Preindustrial Europe*, Barbara A. Hanawalt, ed. (Bloomington, IN: Indiana University Press, 1986), 177.
- ⁸ George Ovitt, Jr., *The Restoration of Perfection: Labor and Technology in Medieval Culture* (New Brunswick, NJ: Rutgers University Press, 1987), 188.
- ⁹ Bonnie S. Anderson and Judith P. Zinsser, *A History of Their Own: Women in Europe from Prehistory to the Present*, vol. 1 (New York: Harper & Row, 1988), 361.
- ¹⁰ Shulamith Shahar, *The Fourth Estate: A History of Women in the Middle Ages* (New York: Methuen & Co., 1983), 242.
- ¹¹ Ivy Pinchbeck, *Women Workers and the Industrial Revolution, 1760 - 1850* (1930; reprint, London: Frank Cass and Co., Ltd., 1977), 2.
- ¹² Ann Oakley, *Woman's Work: The Housewife, Past and Present* (New York: Vintage Books, 1974), 22.
- ¹³ Margaret Ehrenberg, *Women in Prehistory* (Norman: University of Oklahoma, 1989), 62.
- ¹⁴ Oakley, 11.
- ¹⁵ Peggy Reeves Sanday, *Female Power and Male Dominance: On the Origins of Sexual Inequality* (Cambridge: Cambridge University Press, 1981), 80.
- ¹⁶ Yolanda Murphy and Robert F. Murphy, *Women of the Forest* (New York: Columbia University Press, 1974), 129.
- ¹⁷ Eleanor Leacock, "Women in Egalitarian Societies," in *Becoming Visible: Women in European History*, Renate Bridenthal and Claudia Koonz, eds. (Boston: Houghton Mifflin Co., 1977), 20.
- ¹⁸ Leacock, 25.
- ¹⁹ Carolyn Niethammer, *Daughters of the Earth: The Loves and Legends of American Indian Women* (New York: Macmillan Publishing Co., 1977), 116.
- ²⁰ Bella Weitzner, "Notes on the Hidatsa Indians Based on Data Recorded by the Late Gilbert L. Wilson," *Anthropological Papers of the American Museum of Natural History* V 56 Pt 2 (1979), 356-7.
- ²¹ Weitzner, 356-67.
- ²² Rayna Green, *Women in American Indian Society* (New York: Chelsea House Publishers, 1992), 29.
- ²³ Mary R. Beard, *On Understanding Women* (New York: Grosset & Dunlap, 1931), 57.
- ²⁴ Fridtjof Nansen, *Eskimo Life* (London: Longman, Green & Co., 1893), 78, 123.
- ²⁵ Barbara Mayer Wertheimer, *We Were There: The Story of Working Women in America* (New York: Pantheon Books, 1977), 17.
- ²⁶ Wertheimer, 118.
- ²⁷ Jacqueline Jones, *Labor of Love, Labor of Sorrow: Black Women, Work, and the Family from Slavery to the Present* (New York: Basic Books, 1985), 13.
- ²⁸ Julie Roy Jeffrey, *Frontier Women: The Trans-Mississippi West* (New York: Hill and Wang, 1979), 59.
- ²⁹ Joanna L. Stratton, *Pioneer Women: Voices from the Kansas Frontier* (New York: Simon and Schuster, 1981), 146.
- ³⁰ William Loren Katz, *The Black West* (Seattle: Open Hand Publishing, 1987), 291.

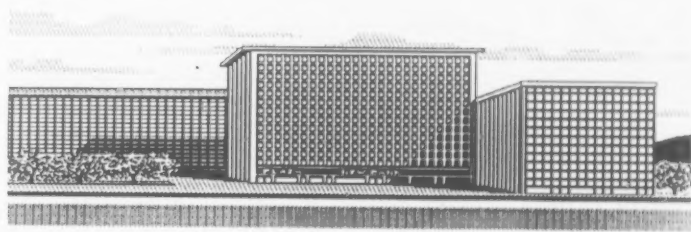
- 31 Sandra Myres, *Westering Women and the Frontier Experience 1800-1915* (Albuquerque: University of New Mexico Press, 1982), 163.
- 32 Lucille McDonald, "Mother Joseph" in *The Women Who Made the West*, Western Writers of America (Garden City, NY: Doubleday, 1980), 120.
- 33 McDonald, 128.
- 34 The Brooklyn Museum, *The Great East River Bridge 1883-1983* (New York: Harry N. Abrams Inc. Publisher, 1983), 7.
- 35 Alan Trachtenberg, *The Brooklyn Bridge: Fact and Symbol* (New York: Oxford University Press, 1965), 94.
- 36 The Brooklyn Museum, 13.
- 37 Trachtenberg, 96.
- 38 The Brooklyn Museum, 13.
- 39 "At one point in 1879, for example, a controversy developed over the honesty of an important contractor, the Edge Moor Iron Company. Ugly insinuations were traded back and forth in the papers and it began to look as though there might be still another drawn-out investigation. To assure the engineering department of their honesty and good intentions, the firm addressed a formal written statement to that effect, not to the Chief Engineer, but to Mrs. Washington A. Roebling. And there was no mention in the letter of conveying any of its contents to her husband, or to ask for his health or to solicit his response or opinions.
"Her services as his 'amanuensis,' as he called her, were enormously important, as he said later. She kept all his records, answered much of his mail, delivered various messages or requests to the bridge offices, went to the bridge itself to check on things for him, and was his representative at occasional social functions. She was quite literally his eyes, his legs, his good right arm." David McCullough, *The Great Bridge* (New York: Simon & Schuster, 1972), 462-4.
- 40 McCullough, 477.
- 41 Trachtenberg, 561.
- 42 Macdonald, 183.
- 43 Jane Yolen, *Simple Gifts: The Story of the Shakers* (New York: Viking Press, 1976), 95.
- 44 Clara Endicott Sears, *Gleanings from Old Shaker Journals* (Boston: Houghton Mifflin Co., 1916), 275.
- 45 Janet M. Hooks, *Women's Occupations Through Seven Decades (Women's Bureau Bulletin No. 218)* (Washington, D.C.: U.S. Government Printing Office, 1947), 198.
- 46 Vare, 164.
- 47 Vare, 103.
- 48 Temma Kaplan, "Women and Spanish Anarchism," in Bridenthal, 407.
- 49 Ruth B. Dixon, *Rural Women at Work: Strategies for Development in South Asia* (Baltimore: Johns Hopkins University, 1978), 22-3.
- 50 Lydia Kung, *Women and Work in Traditional China* (Ann Arbor, MI: UMI Research Press, 1983), 19.
- 51 Mary Saso, *Women in the Japanese Workplace* (London: Hilary Shipman Limited, 1990), 58-60.
- 52 Bernice Glatzer Rosenthal, "Love on the Tractor: Women in the Russian Revolution

and After," Bridenthal, 387. Apparently the idea of women's work has resurfaced. In 1987, a group of Russian women in Vermont on a goodwill tour met with the coordinator of STEP UP for Women, a job training program in the skilled trades. When told that participants were trained for jobs such as carpentry, one of the women expressed surprise. She thought carpentry work was too hard for women.

⁵³ Rosenthal, 390.

⁵⁴ Rosenthal, 391.

ARCHITECTURE



Architecture

Women in many cultures have served as the architects and builders of homes for themselves and their families. While we can mostly conjecture about the role of ancient women in building design and construction, the role of Native American women in many tribes is well-documented. Among the Hopi of the Southwest, women built the adobe structures; among the Plains tribes, women built the tipis, preparing the hides for stretching and selecting the poles.¹ Women of the Hidatsa and Ojibwa tribes in the northern United States and Canada were responsible for much of the construction of the multi-family lodges.² The design of the structures was passed down from mother to daughter through many generations.

Several women in ancient times are credited with the design and construction of monuments and cities. It is difficult to know whether they were primarily the patrons who commissioned the buildings, or whether they took active roles. For example, Sebek-Neferu-Ra, who ruled Egypt in 2133 BC, was considered one of the greatest builders of her era. Among other projects, she is credited with the construction of the Labyrinth, one of the Seven Wonders of the Ancient World.³

Even in Colonial America, women occasionally served as architects. A woman named Christine Zeller planned and oversaw the construction of a fort in Lebanon, Pennsylvania in 1745.⁴

American women continued to demonstrate interest in architecture in the nineteenth century. The first history of architecture in the United States, published in 1848, was written by Louisa C. Tuthill. Harriet Beecher Stowe, of *Uncle Tom's Cabin* fame, and her sister Catharine wrote *Treatise: American Woman's Home* in 1869. In it they "detailed plans for making houses more functional, more comfortable, better ventilated, and easier to clean."⁵

At about the same time, a male architectural critic challenged women to design their own houses if they didn't like the way men designed them.⁶ Harriet Morrison Irwin, an upper-class housewife from Charlotte, North Carolina, took up the challenge. Teaching herself the principles of building construction by studying books, she designed a six-sided house based on ergonomic principles and had it built in Charlotte, where it stood until recent years. Furthermore, she patented her design in 1869, and her husband and brother-in-law marketed and built hexagonal homes according to her design.⁷

Architecture became more formally organized as a profession in the nineteenth century and architectural schools were founded at many land-grant universities across the country. Despite the fact that these land-grant schools were open to women, few enrolled in architectural programs. Many of the first women architects learned their profession in other ways. Louise Blanchard Bethune, the first American woman professional architect, served an apprenticeship with an architect in Buffalo, New York. She opened her office in Buffalo in 1881, and in 1888 was elected the first woman member of the American Institute of Architects. Her work included designs for a wide variety of buildings, including chapels, factories, stables, armories, residences and schools. "In those early days

of the profession she advocated equal pay for women, tried to improve standards by urging the licensing of architects, and refused to bid competitively.⁸

Nora Stanton Blatch Barney was a civil engineer, architect, and developer, and the first woman member of the American Society of Civil Engineers. "As an architect she prided herself on her control over the plans for the houses she built and her crew of skilled workmen."⁹ Born in 1883, she was the granddaughter of suffragist Elizabeth Cady Stanton.

Another early woman architect, Minerva Parker Nichols learned "catch-as-catch-can, partly in the Philadelphia Normal Art School, partly by drafting in an architect's office, and partly through a course in architectural drawing at the Franklin Institute."¹⁰

By 1910, "only about 50 women were recognized as 'trained architects,' though others had acquired training through apprenticeship, tutoring, or correspondence schools. According to Anne Macdonald,

men were still sputtering that "ladies" would not engage in a profession that required them to mount ladders – to which one of the new breed replied that as far as she could gather, there was nothing wrong with climbing, only being *seen* climbing:

"Climbing a ladder is condemned as unwomanly, but so was riding a bicycle or being seen on the top of an omnibus not so very long ago, and yet we are now all seemingly reconciled to these unwomanly practices. Besides the ladder question could only be raised by persons who are in ignorance of the portion of a lifetime that an architect spends upon a ladder, and as this is so infinitesimal it is unworthy of consideration."¹¹

From the beginning, women encountered resistance to their presence at many architectural schools, and for a number of years the architectural schools at major universities were closed to them altogether. The field opened up, at least in terms of training opportunities, when the Cambridge School of Architecture and Landscape Architecture opened in 1916, the first architectural school for women in the United States. Along with the Lowthorpe School of Landscape Architecture, Gardening and Horticulture for Women, it provided excellent training, and they produced some of the best architects and landscape architects of the time.¹² The Cambridge School closed in 1942 due to World War II. At the same time, the Harvard Graduate School of Design began to accept women, filling the class slots left empty by men fighting in the war. The Cambridge School never reopened.¹³

Today, the number of women architects is increasing throughout the world, but they remain a minority in every country. In Australia in 1989, women constituted 3 percent of the architects; in both Spain and the United States, only 5 percent of the architects are women. Women architects fare better in the Scandinavian countries of Norway, Sweden, Finland, and Denmark, where they are 20 percent of the profession.¹⁴

Despite their small numbers, women architects are making an impact on their profession. Birgit Cold, an architect from Norway, concluded after years of research that men and women have different approaches to architecture. Eve Laron, an Australian

architect, sees part of that difference as women's concern for designing buildings that are responsive to the users' needs, as opposed to that of the client who commissions but may never use the building, or the architect who expresses his ego through designs that will win the praise of other architects or architectural critics. Two women who demonstrate this focus in very different ways are Madhu Sarin from India, who designs buildings for the poorest communities in her country; and Jane Thompson from the United States, who "repeatedly proves her skill in revitalizing urban spaces the world over, to which the public flocks."¹⁵

The numbers of women entering architecture schools is increasing dramatically. According to Clare Lorenz, "at the Architectural Association School of Architecture in London, the entry figure for first year women students rose from 14 percent in 1976 to 31 percent in 1986 and 48 percent in 1987. At the Bergen School of Architecture in Norway, 64 percent of the 1988 intake was women."¹⁶

Women have participated in virtually every aspect of architecture. Lorenz notes, "I have tried, out of curiosity, to find areas or categories of work in which women have not, as yet, contributed fully to architecture. After much research I can only report that I have not yet come across designs for a munitions factory."¹⁷

Mother Joseph (Esther Pariseau)

Architect, Carpenter, Nun
Canada, United States
1823 - 1902

Born into a farming family in rural Quebec, Esther Pariseau grew up watching and working with her father in his carriage shop. "Before she was ten, she could recognize various kinds of timber, how they had to be seasoned and which were most durable. In another two years, she was using hammer, chisel, drawing knife and saw."¹⁸ She was educated first at home by her mother, then at a boarding school that opened in a nearby community when she was seventeen. She excelled at every subject, and became skilled in a wide variety of trades and crafts: spinning, weaving, needlework, gardening, cooking, woodworking.

At the age of twenty, she entered a newly founded religious order, the Sisters of Providence. When she joined, her father predicted that she would someday make a good Mother Superior.

Her work with the Sisters of Providence took her to Vancouver, Washington in 1856, where she built her own quarters, and worked on the first Catholic school, mission, and orphanage in Vancouver.

As her mission grew, she struggled to find the funds to build larger facilities, and finally designed and supervised the construction of the House of Providence in Vancouver, which was three stories high, covered two acres, and was reported to be the largest building north of San Francisco. The building was occupied beginning in 1873, but the total construction was not completed until 1892.

Mother Joseph's reputation as an architect spread, and she designed many other buildings, including schools, hospitals, and orphanages, for her order throughout the Pacific Northwest. Her last project was an orphanage in British Columbia. "Although then in her seventies, Mother Joseph stayed right on the job with her building program, climbing ladders to test beams and inspect the work."¹⁹

Many years after her death, Mother Joseph's achievements received wide acclaim. The American Institute of Architects, in 1953, called her the Pacific Northwest's first architect.²⁰ The West Coast Lumbermen's Association also recognized her as "the first white artisan to work with wood in the Pacific Northwest." One writer said of her, "She was adept in nearly all the arts and trades. She was skilled in wax works, the most delicate embroidery, but her genius found its strongest expression in architecture."²¹

Marion Mahony Griffin

Architect
United States
20th Century

The second woman to graduate from MIT's architectural program was Marion Mahony Griffin. In 1895 she went to work in the office of Frank Lloyd Wright as one of his first assistants. "She was largely responsible for the success of the 1910 'Wasmuth Portfolio,' which introduced Wright to the world. Her drafting style was superb and she became responsible for more and more of Wright's interiors."²²

After her marriage, she lived in India and Australia. When her husband died in 1934, she returned to Chicago and worked alone for the next twenty years. Her major projects included a plan for redeveloping South Chicago and the World's Fellowship Center in New Hampshire. The British architecture critic Reyner Benham has written that Griffin was "America's (and perhaps the world's) first woman architect who needed no apology in a world of men."²³

Ellen Biddle Shipman

Landscape Architect
United States
1870 - 1950

Ellen Biddle Shipman was one of the leading women landscape architects in the first half of this century. She taught for many years at the Lowthorpe School of Landscape Architecture, Gardening and Horticulture for Women, and throughout her long career she always promoted women in the profession. *House and Garden* magazine called her the dean of women landscape architects.

Shipman maintained offices in both New York City and Cornish, New Hampshire, where she employed all women architects and draftswomen. At the time, women were seldom hired in male-owned landscape architecture offices, so she was instrumental in launching the careers many women who became successful in the profession.

Most of her work was private commissions, because women seldom received public work at the time. She designed gardens and estates in virtually all of the Eastern half of the country, from Texas to Michigan and North Carolina to New Hampshire.²⁴

Julia Morgan
Architect
United States
1872 - 1957

Julia Morgan was an architect whose work has recently attracted new interest and respect as being representative of the Beaux Arts style of architecture and California regional architecture. Her most famous work, although few know she was the genius who designed it, is the fabulously ornate Hearst Castle, located between San Francisco and Los Angeles. She worked on the project for over twenty years, commuting by train from San Francisco nearly every weekend to supervise the construction.

Morgan had an active practice for nearly 50 years, during which she designed nearly 700 buildings. These covered a wide range of styles and functions, including schools, churches, stores, YWCAs, hospitals, houses, apartments, and even hay barns.

She was born and raised in California, and was the first woman to graduate from the University of California at Berkeley's College of Engineering in 1894. Following that she received a degree from the École des Beaux Arts in Paris in 1902, the first woman in its architectural school. Upon her return to California, Morgan became the first woman to be licensed as an architect in California.

"Always an engineer as well as an architect, she was particularly interested in using reinforced concrete for both domestic and public architecture."²⁵ Sara Holms Boutelle, one of Morgan's biographers, summarized her achievements:

Morgan's interest in craft and ornamentation seems progressive today, and her sympathetic response to her clients' desires an admirable and much-needed lesson. The buildings that Morgan designed in numerous cities for the YWCA helped solve problems still plaguing cities, and with magazines now showing new, innovative YWCA designs, attention is again being paid to these earlier structures. Morgan's role as a woman in a field still largely dominated by men has been another factor in the growing appreciation of her accomplishments.

But it is the particular quality of Morgan's buildings that most evokes interest today. Her preoccupation with light, with the relationship of a structure to its site, with flexibility of plan, with indoor-outdoor lighting, and with the use of color and decoration make her work relevant to contemporary designers. Her devotion to quality, to craftsmanship, and to the most exacting standards is appealing even though it is unlikely ever to be duplicated. Her generosity of spirit, as evidenced by the profit sharing in the office and her support of her staff and their children, is unfortunately not a practical working model for most contemporary firms,

but the evidence of it helps make her come alive as a person dedicated to her associates and to the practice of architecture.²⁶

Eleanor Raymond
Architect
United States
1887 - ?

Architect Eleanor Raymond was noted particularly for her pioneering use of new materials. In 1933 *Architectural Forum* credited her with the design of the "first modern house in Massachusetts." "In 1940 she built an all-plywood house; in 1944, one that featured masonite inside and out for walls, ceilings, floors, kitchen cupboards, and countertops, and in 1948 she designed her vanguard Solar House."²⁷

The solar house project, the first to use passive solar rather than active solar photovoltaic panels, was designed in collaboration with chemist/engineer Maria Telkes, and was located in Dover, Massachusetts. "I acted as the catalyst," Raymond recalled. "Miss Amelia Peabody [the property owner] had the money and the interest in experimentation, and Dr. Telkes had the theories."²⁸ The Institute of Architects awarded her their highest honor for the design.

Raymond constructed homes throughout New England which were noted for their environmental sensitivity.²⁹

Norma Merrick Sklarek
Architect
United States
1928 -

Norma Sklarek entered the School of Architecture at Columbia University in the mid-1940s, having never seen a T-square or a triangle, and without any role models. She graduated in 1950. She became the first African-American woman to become a licensed architect in the United States, and was the first to become a fellow of the American Institute of Architects. Today she is a principal partner in the firm Siegel-Sklarek-Diamond in Los Angeles, which she says is "unique in that we are probably the largest totally woman-owned architectural firm in the United States."³⁰

Sklarek's major projects have included the San Bernardino (California) City Hall, the United States Embassy in Tokyo, and Terminal One at Los Angeles International Airport. She stated her philosophy, "Architects should be working on improving the environment of people in their homes, in their places of work, and their places of recreation. It should be functional and pleasant, not just in the image of the architect's ego."³¹

- ¹ Dorothy Schneider and Carl J. Schneider, *The ABC-CLIO Companion to Women in the Workplace* (Santa Barbara: ABC-CLIO, Inc., 1993), 15.
- ² Gilbert L. Wilson (Bella Weitzner, ed.), "The Hidatsa Earthlodge," *Anthropological Papers of the American Museum of Natural History* Vol 33 Pt 5 (1934):
- ³ DeLysle Ferree Cass and Ryan A. Kuhn, "Annals of Womankind," in *Women's Almanac: 12 How-to Handbooks in One*, Kathryn Paulsen and Ryan A. Kuhn (New York: Armitage Press/Information House, 1976), 31.
- ⁴ Cass, 252.
- ⁵ Schneider, 15.
- ⁶ Ethlie Ann Vare and Greg Ptacek, *Mothers of Invention: From the Bra to the Bomb: Forgotten Women and Their Unforgettable Ideas* (New York: Quill/William Morrow, 1987), 165.
- ⁷ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 43.
- ⁸ Schneider, 27.
- ⁹ Schneider, 23.
- ¹⁰ Schneider, 15.
- ¹¹ Macdonald, 257.
- ¹² Leslie Rose Close, "Ellen Biddle Shipman," in *American Landscape Architecture*, William Tishler, ed. (The Preservation Press, 1989), 90.
- ¹³ Schneider, 16.
- ¹⁴ Clare Lorenz, *Women in Architecture: A Contemporary Perspective* (New York: Rizzoli International Publications, 1990), 8.
- ¹⁵ Lorenz, 8.
- ¹⁶ Lorenz, 9.
- ¹⁷ Lorenz, 9.
- ¹⁸ Lucille McDonald, "Mother Joseph" in *The Women Who Made the West*, Western Writers of America (Garden City, NY: Doubleday, 1980), 127.
- ¹⁹ McDonald, 128.
- ²⁰ Note: they called her the first architect, not *woman* architect.
- ²¹ McDonald, 128.
- ²² Lois Decker O'Neill, *The Women's Book of World Records and Achievements* (Garden City: Anchor Press/Doubleday, 1979), 609.
- ²³ Quoted in O'Neill, 609.
- ²⁴ Close, 90.
- ²⁵ Sara Holms Boutelle, *Julia Morgan: Architect* (New York: Abbeville Press Publishers/Cross River Press, Inc., 1988), 16.
- ²⁶ Boutelle, 17.
- ²⁷ O'Neill, 609.
- ²⁸ Vare, 160.
- ²⁹ Vare, 161.
- ³⁰ Brian Lanker, *I Dream a World: Portraits of Black Women Who Changed America* (New York: Stewart, Tabori & Chang, 1989).
- ³¹ Quoted in Lanker.

ENGINEERING



Engineering

Ancient Egypt provides two examples of women's engineering accomplishments. Nitocris was an Ethiopian who became a queen of Egypt. Herodotus recorded that she

demonstrated remarkable engineering insight during her reign. She routed the Euphrates so that it would pass a certain city. She built a large basin so that the river could form a reservoir. She lined the embankment with stones... displaying an unusual interest in conservation. She built a stone bridge across the largest span of a river to unite two halves of her city and had it constructed so that the bridge planks could be taken up at night, thereby discouraging nocturnal crimes.¹

Author Jeanne Noble called Nitocris "an outstanding engineer, conservationist, and city planner – really the first in human history to combine all these talents into a blueprint for city living."² Another Egyptian woman, the legendary Queen Moo, is said to have engineered the building of the Sphinx.³

Engineering expanded as a profession between 1890 and 1900, and has been one of the most strongly-held male professional bastions. Few women entered the profession, and those that did encountered significant obstacles to their success in the field. Of the 130,000 engineers counted in the 1920 census; only 41 were women⁴ – about .0003 percent.

Despite their small numbers, women who entered engineering in the early part of the twentieth century made significant contributions. Marie Luhring was elected to the American Society of Automotive Engineers in 1920. Electrical engineer Edith Clarke received the first engineering degree that MIT granted a woman. Her work "focused on large electrical systems constructed by interconnecting smaller systems, working out predictive calculative devices that she patented. Later she moved on to apparatus and system analysis, writing numerous articles and a book that became a standard graduate text."⁵

Engineering schools increased their efforts toward recruiting women in the 1970s, but by 1990 engineering was still the most male dominated white-collar profession in the United States.⁶ In 1990, women represented 15 percent of new engineers entering the work force and less than 9 percent of civilian engineers over all.⁷

Engineering is one of the best paid professions for women. In 1986, starting salaries offered to women engineers averaged slightly above those offered male engineers. However, women tend to remain clustered in lower level positions with fewer opportunities to move into management than men engineers within the same companies. Studies by Judith McIlwee and J. Gregg Robinson suggest that

in companies where engineers as a group are powerful, they tend to shut women out. In companies where engineers are less powerful, women

engineers flourish. Women tend to advance less than men in high-tech firms and electrical engineering, as much as or more than men in aerospace and mechanical engineering.⁸

Solar Technology

Maria Telkes received the first Achievement Award given by the Society of Women Engineers, in 1952, for a woman who has made a significant contribution to engineering. Born in Hungary, Telkes immigrated to the United States in 1927. She was an early believer in the feasibility of solar power, and much of her work has focused on solar energy technology. She was Eleanor Raymond's partner in the design of the first passive solar house.⁹ She holds many patents for her solar inventions, which include a solar still for life rafts, a solar-powered oven, and solar heating equipment for houses.¹⁰

An assistant of Maria Telkes has also made significant contributions to solar technology. Countess Stella Andrassy was born in Sweden in 1903 to a titled family, and took science classes in college, although her main course of study was to become a concert pianist. She married a Hungarian count in 1919, and lived the life of nobility until they were forced to flee during World War II. Arriving in New York City, with little to her name, she met Maria Telkes and began working as her assistant.¹¹ Andrassy has patented nine solar-powered devices, including a food drier, an oven, a water heater, and a still for turning seawater into fresh water. Well into her eighties, Countess Andrassy was continuing her experiments at Princeton University's research facilities.¹² Other inventions include a "method for turning sewer sludge into sterilized fertilizer with distilled water as a by-product,"¹³ and a method to extract oil from Canada's huge tar sand fields.

Hertha Ayrton

Electrical Engineer, Inventor
England
1854 - 1923

Hertha Ayrton's greatest contribution was in her study of the electric arc, which made her the world's preeminent expert on the subject. In 1898 she became the first woman elected to Britain's Institution of Electrical Engineers. Her inventions included the sphygmograph, which monitors the human pulse; standardized search lights for the British military; and the Ayrton Fan used in World War I for dispersing mustard gas.¹⁴ Her first invention was a device for dividing a line into equal parts, which was useful to architects, artists, and engineers.

Born Phoebe Sarah Marks, she was the third child of a Polish-Jewish refugee in England. The family was poor, and she was able to attend school only because her aunt

ran a school in London. She was a nonconformist throughout her life, but always expressed pride in her Jewish heritage. She changed her name to Hertha as a gesture of independence.¹⁵

Marks decided to pursue a career of scientific research, and attended Finsbury Technical College. There she met physics professor W.E. Ayrton, whom she married in 1885. They had one child, a daughter, in 1892.

Hertha Ayrton continued her scientific work after marriage, giving basic lectures on electricity in 1888. She resumed her experimental work in 1893 and published a book, *The Electric Arc*, in 1901, which became the standard textbook on the subject. The first time a paper of hers was presented before the Royal Society, the Society did not allow women to present papers, and a male colleague had to read the paper for her. Three years later, she became the first woman to read a paper before the Royal Society.

Later in her life, Ayrton became involved in the women's movement. She believed strongly that there was no connection between gender and one's ability as a scientist. She remained active in her research and political causes until her death in 1923.

¹ Jeanne Noble, *Beautiful, Also, are the Souls of My Black Sisters* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1978), 9.

² Noble, 9.

³ Noble, 7.

⁴ Dorothy Schneider and Carl J. Schneider, *The ABC-CLIO Companion to Women in the Workplace* (Santa Barbara: ABC-CLIO, Inc., 1993), 82.

⁵ Schneider, 51.

⁶ The construction trades, with less than 4% women on average, continue to hold the record for male dominance in any occupational category.

⁷ Schneider, 82.

⁸ Schneider, 82.

⁹ Ethlie Ann Vare and Greg Ptacek, *Mothers of Invention: From the Bra to the Bomb: Forgotten Women and Their Unforgettable Ideas* (New York: Quill/William Morrow, 1987), 161.

¹⁰ Lois Decker O'Neill, *The Women's Book of World Records and Achievements* (Garden City: Anchor Press/Doubleday, 1979), 189.

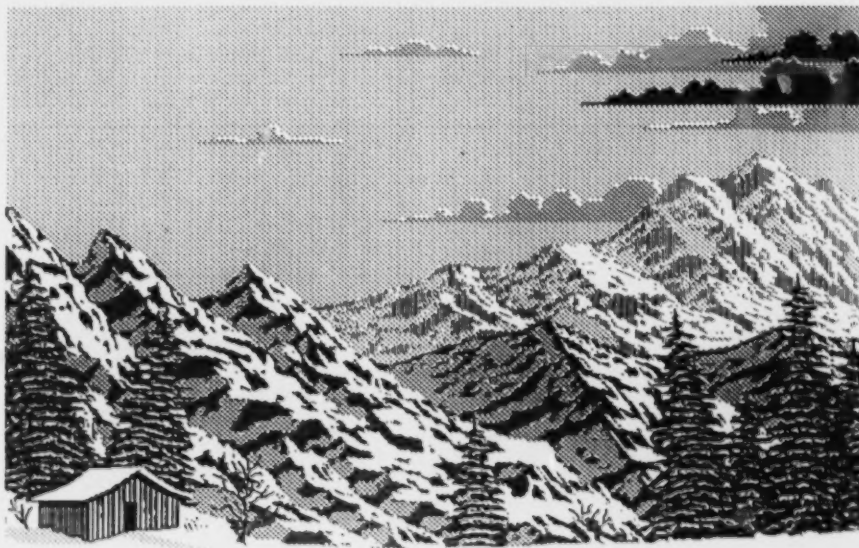
¹¹ Vare, 161.

¹² Vare, 162.

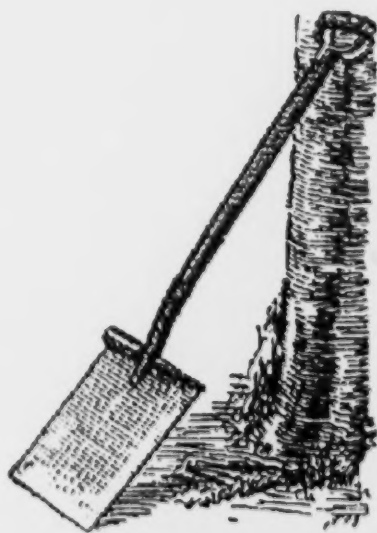
¹³ Vare, 162.

¹⁴ Vare, 159.

¹⁵ Marilyn Bailey Ogilvie, *Women in Science: Antiquity through the Nineteenth Century* (Cambridge: MIT Press, 1986), 33.



M I N I N G



Mining

Europe, 14th - 18th Centuries

Women have worked in the mining industry at least since the Middle Ages, when the first coal mines were opened in England and Scotland. From the beginning, women worked underground in the pits as well as at the surface.

An early record of a woman miner refers to Emma Culhare, who was killed while drawing water in a "colepyt" in 1322. A later record mentions that women were working in a mine in 1587 "for lack of men."¹

The earliest coal mines in England and Scotland were small and shallow, worked by hand with primitive tools. The total output was fairly limited. Most miners were serfs who were bound to the land under the feudal system. They were accustomed to working in family groups – father, mother, and children worked together on the land. Even the smallest children contributed to the work as soon as they were able. Commonly, the father would dig or "hew" the coal; the mother and children carried it up ladders to the surface. Those who carried coal were called "bearers."

Although some observers at the time claimed that the work was not overly strenuous, one wrote that "the weight of coals thus brought to the pit top by a woman in a day, amounts to 4080 pounds or above thirty-six hundred weight English, and there have been frequent instances of two tons being carried."² The coals were carried in a large bag or sling, and often it was so heavy that two men were required to lift it onto the bearer's back. The bearer then carried the coal from the pit wall, up a ladder and out to the surface.

After the feudal period, workers were free men and women employed by the mine owner. In Scotland, however, the miners and their families "became the property of the coal master."³ Quite literally, they were slaves who could not leave to find other work, and who were likely to be hunted down and forced to return if they ran away. They became free through an act of emancipation in 1799.

The introduction of new machines during the Industrial Revolution in the eighteenth century made it possible for mines to become deeper and larger. These changes made the work of mining more dangerous, and many miners were injured or killed in their work. Women's names frequently appear on the lists of injuries, showing that they were working underground in the pits.⁴

As industrialization progressed, most mines introduced equipment that lifted the loads of coal up out of the pit. Then the bearers carried the coal from the pit wall to the bottom of the shaft. If the vein of coal being worked was thin, the women might have to carry their loads while they walked bent over at the waist, or crawled on hands and knees, pulling a cart behind them by means of a chain attached to a harness around the waist. The roads they crawled on were often soft and wet, and sometimes had standing water. The best mines used horse-drawn carts to carry the coal, and women and children drove the horses.

Women and children also worked at the surface of the coal mines, at the "pit brow," which in some areas was called the "pit bonk" (pit bank). They sorted and loaded the coal into trains and boats.

In metal mines, women also worked at the surface, where they were the majority of workers who sorted, broke, and washed ores. While this work was not as strenuous as that below, breaking stones with a hammer for ten or twelve hours was still exhausting work.

Women worked in mines in other regions of Europe, as well. There are records of women working "in the mines of Germany and Czechoslovakia, panning, hauling, and sorting the ore"⁵ in the fourteenth century. In areas with "silver and lead mines, it was the women who rinsed the lead in toughs and passed it through filters."⁶ They also worked in Russian mines.

Throughout the Middle Ages and into the seventeenth century, a few women owned and/or managed mines. A woman named Flanders supervised mining operations in 1372,⁷ and Barbara Uttman took over supervision of her husband's mines in Annenburg after his death in about 1560.⁸ Barbara Milburne, Mary Hall, and Barbara Riddle are three women who "owned or administered coal mines" in England in the seventeenth century.⁹

Europe, 19th Century

Until the middle of the nineteenth century, the work of women underground in coal mines did not attract much attention. Many women began their careers as young as six years old, working as "trappers" who controlled the air doors of the ventilation system. It was not physically difficult work, but involved the longest hours, since they had to be the first to arrive and the last to leave the mine each day. For twelve or more hours a day, they worked alone in darkness. When they became seven or eight, they moved into other positions.

Most of the women and girls working underground were "hurriers" or "drawers" who hauled the coal on their backs or in carts. In the better mines with thick veins of coal, most coal was drawn in wagons by horses. Women and girls usually drove the horses. The method of drawing by the chain and belt persisted in the smaller mines.

In a few cases, women even worked as "hewers" or "getters," actually digging the coal. Hewing, the highest status and best paid job in the mines, was work usually reserved for men. In some cases, women hewed coal in small mines, or where the collier employed his hurrier to assist him. Occasionally if a man became incapacitated, his wife would take his place and do the work of the hewer.¹⁰

By the mid-nineteenth century in England, women worked underground in a few scattered regions. Most were working at the surface on the "pit brows," where they weighed, screened, cleaned the coal and loaded it into railway cars or canal boats. In one region, the apprenticeship records included numerous contracts of boys apprenticed to women miners. For example, John Sheldon was apprenticed to "Eliz. Sheldon, widow and miner...to instruct John Sheldon in the art of mining."¹¹

In the 1840s, the Children's Employment Commission began an investigation of the use of child labor in British coal mines. When they realized that the use of female labor was greater than they had supposed, they widened the scope of their investigation to include adult women as well as children. The *First Report of the Children's Employment Commission, on Mines* was published in 1842. It contained sensationalized descriptions of women and girls, working naked to the waist, drawing heavy carts by the belt and chain. The report was not much concerned with the difficulty of the work; instead, it focused on the "immorality" and "indecent" of women working under these conditions, and whether their demanding work hours permitted them to attend church on Sundays. The report created a huge stir among the middle class of Victorian England, which led to the passing of the Coalmines Regulation Act, outlawing the employment of women and girls underground. As a result, over 6,000 women were thrown out of work and barred from the best paid jobs available in their rural regions.

In 1855, Arthur Munby, a London civil servant who was fascinated with women who did physical labor, sought out a number of women who had testified before the Commission in 1842. According to his journals, most of them told Munby they would go back to work underground if they could.¹²

Excluded from working underground, women continued working on the pit brow. But the issue of women in mining wouldn't go away. In 1865,

the controversy over the moral and physical hazards of mine work for women was renewed when it was discovered that women were being employed for surface work – sorting out coal as "pit brow women." There were less than five thousand women so employed, and they were paid half the wages of men doing the same work. Compared to work inside the mine, pit-brow work was not particularly arduous, but to some male observers it was particularly disturbing because the women sometimes wore trousers and engaged in strenuous labor in close proximity to men.... The workers themselves seem to have found it desirable and respectable labor.¹³

This time it was the miners' unions that objected to women working on the pit brow. They claimed "that the practice of employing females on or about the pit banks of mines and collieries is degrading to the sex, leads to gross immorality, and stands as a foul blot on the civilization and humanity of the kingdom."¹⁴ Their allegations were based on the facts that some women wore trousers, which were eminently suitable work attire, and that employment made them less attentive housekeepers, which inconvenienced their husbands. They ignored the facts that women worked out of necessity, that alternative well-paid work was not available, and that alternative employment in domestic service or factories would still keep women away from their homes.

Organized resistance to the miners' attempts was staged by mine owners, the women, and feminists. This time, the Committee decided in favor of the women.

One final attempt to remove women from pit brow work was made in 1886. Trousers were again the main issue, despite the fact that they were common work attire in only one small region. The Mines Regulation Bill passed in 1886 allowed women to work on the pit brow, but limited their hours.

The tin and copper mines of Cornwall and Devon also employed women who worked on the surface, where they broke and sorted lumps of ore. There is no indication of women working below ground in these metal mines. The work was generally well-paid compared to other employment available in the region, and the "Bâl Maidens" ("Bâl" is Cornish for "mine") were relatively independent. The Bâl Maidens worked during the eighteenth and nineteenth centuries. They gradually disappeared as the mines were played out.

Women also worked as ballast diggers in clay quarries. The digger's job

was to claw clay down from a quarry face with a pickaxe, load it with a spade into a barrow, and wheel the barrowload of clay down to the riverside wharf where vessels moored to take on ballast. She earned one penny for every ton shifted; one ton meant eight barrowloads of clay.¹⁵

One digger, Hannah West, told Arthur Munby, "I can only earn a shilling a day, Sir, ... *twelve tons is as much as I can dig in one day.*"¹⁶

Through the nineteenth century, women continued to work in mines in the rest of Europe, although they, too, were gradually excluded from underground work by protective legislation. In France, women worked underground as drawers in coal mines until 1874 when they were restricted by law to surface work. They worked underground in Belgium's coal mines through the 1860s, but gradually became rare. Germany passed legislation in 1891 outlawing women working underground.

In Asian regions of Russia, "throughout second half of the nineteenth century, the Yenisey and Lena Goldfields company had 25,000 - 30,000 employees, many of them women. The gold lay near the surface in gravels and was dug out by fairly primitive methods."¹⁷

United States - 19th Century

The miners who worked in the first U.S. coal mines were primarily Welsh, Scottish, and English immigrants. "They brought with them from the British Isles militant trade union views and formed the first American coal mining unions.... It was these miners who in the early days incorporated the provision into their unions that women should not work in American mines...."¹⁸ That prohibition became law in 1879 when the State of Illinois passed "an Act for providing for the health and safety of persons employed in coal mines." It was the first U.S. labor law that prohibited or limited the employment of women.¹⁹

A few women in the American West "wrote of assisting their husbands and fathers during the gold rush days in California, Colorado, and Idaho."²⁰ Nearly 100 women made the arduous trip on the Chilkoot Trail to Alaska in the Klondike stampede in 1898. Unfortunately, all the claims had been staked before the news ever leaked out of Alaska, and none of the stampeders - male or female - found gold. However, twelve resourceful

women cashed in on the stampede by working as packers on the legendary "Golden Stairs" of the Chilkoot Trail.

A few women in the West

managed and supervised their own mines. Delia McCarthy was president and general manager of the Cooperative Mining and Milling Company of Cripple Creek and secretary in [Mrs. E.C.] Atwood's Bonacord Gold Mining and Milling Company.... [T]wo women operated the Silver Mountain Mining Company and the Clear Creek Mining Company near Denver; another managed the Highland Mining Company, owned seventeen mines, and supervised construction of a tunnel from the Las Animas River to her mine near Mary, Colorado. Utah also had several women mining entrepreneurs.²¹

Twentieth Century

Women have continued to work in mines – both underground and on the surface – throughout the twentieth century. In England, women worked on coal mine pit brows until 1972.

Women in developing countries have also worked in mines, although they are gradually being excluded. For example, in India in 1922 there were nearly 80,000 women working underground in mines. In that year, the Indian government moved to prohibit their employment underground.²² In China, women pushed carts of coal in the mines, and in the 1970s, they also worked in the oilfields.

In the United States, women were hired for mine work during World War II. They "pulled off a wildcat strike for better working conditions, and at the end of the war fought to hold on to their jobs. In the early 1970s a union-backed equal opportunity lawsuit ... forced the hiring of more women."²³ During the Arizona Mine Strike of 1983,

women copper miners and women related to male miners were so prominent in this year-and-a-half strike that a police officer remarked, "If we could just get rid of these broads, we'd have it made"....

A consortium of 20 miners' unions had negotiated for a new contract with all the major copper-producing companies. When the employer, Phelps Dodge, refused the contract, miners at four different sites walked out. Undaunted by arrests, handcuffs, chains, shackles, a flood, evictions, and injunctions, women walked the picket lines (one, composed entirely of women, was a mile long), endured the sexual harassment and brandished guns of the scabs, raised money for food, established a day-care center for picketers' children, bartered for each other's skills and services, wrote letters that evoked sympathy and support from all over the country and from abroad, and organized speaking tours. They transformed themselves.

The strike ended inconclusively with the unions decertified, and the company in deep economic trouble. Despite the many arrests, no one went to prison. Strikers won suits against or settled for damages from the county and the sheriff for violation of their civil rights."²⁴

According to Gill Burke, "It is the coal-mining women of the United States who can be said to offer the strongest contemporary challenge to the view that mining is "men's work" since they have reclaimed underground work as a right and as a skill at a time when, in the developing countries, women are increasingly being excluded."²⁵

Nellie Cashman
Prospector, Entrepreneur
United States, Canada
1851 - 1925

Nellie Cashman was the kind of adventurous person destined to become the source of legends. She made her mark on the American West as a prospector, entrepreneur, and doer of good deeds.

Born in Ireland, Nellie immigrated to the United States at the age of 16 with her mother and sister. After several years, they moved to San Francisco. Nellie's sister married, and in 1874, Nellie signed on as cook to a group of miners headed for the Cassiar District near Juneau, Alaska. There she caught the prospecting bug, and would continue her search for gold for the rest of her life.

That fall, Nellie left for Victoria, British Columbia. Upon her arrival, she received word that her miner friends in Cassiar were trapped by a winter storm and with most of their supplies exhausted, they were dying of starvation and scurvy. Nellie promptly bought potatoes and vegetables, hired six men to assist her, and headed back to Alaska. They struggled over rough terrain through severe winter weather, but reached the mining camp in time to save many lives. Her courage and generosity earned her the name "The Angel of Cassiar."

Several years later, Nellie turned up in mining camps in Nevada, and in 1879, moved to Tucson, Arizona. The next year, she followed news of a silver strike to Tombstone, Arizona, where she lived for a number of years and became part of the town's legend. Throughout this period, she sometimes prospected and sometimes cooked. In Tombstone, she started a restaurant and was the first woman to start her own business there.

Nellie's high spirits and strict religious beliefs earned her respect everywhere she went, in a time when women in mining camps were not noted for their good character. In particular, Nellie was known for her charities and generosity. She fed those with no money, grubstaked miners, took care of the ill. And she persuaded many people in the community to support her causes. She made and gave away several fortunes from her

mining claims, and when friends loaned her money when she was broke, they generally considered it a donation to a good cause. It was known that Nellie would give away any money given to her.

When her sister was widowed in 1880, Nellie immediately brought her and her five young children to live in Tombstone. Several years later, the sister died, and Nellie assumed total responsibility for her nieces and nephews, moving them with her to various mining camps throughout the West.

In 1897, when the children were grown, Nellie headed to Alaska as part of the Klondike gold rush. With thousands of other miners, she spent the brutal winter hauling supplies over the Chilkoot Pass to the Yukon River. She settled in Dawson, which was a tough mining camp, and opened a restaurant and general store. When she realized there was no place for miners to go besides the bars, she converted the store into "The Prospectors' Haven of Rest." There she offered free coffee and cigars, and a pleasant place for reading and writing.

For the rest of her life, she continued prospecting and running restaurants. She is "credited with being the first woman prospector in the Alaska Territory." When in her 60s and 70s, Nellie was living in remote cabins, where she had to "travel 12 miles by snowshoe to lay in supplies and pick up her mail."

While in her seventies, Nellie staked her last claim at Coldfoot, the northernmost mining camp in Alaska. While there in 1924, she fell seriously ill, and friends hauled her 1,000 miles to the hospital in Fairbanks, where she was treated for pneumonia. She tried to return to her Coldfoot claim, but her strength never fully returned. Friends persuaded her to retire to Victoria, British Columbia. She died there in a Catholic hospital that she, through her charities, had helped to build.

Cashman's biographer, Don Chaput, stated this conclusion: "I know of no other stampeder who showed such endurance, such optimism and who earned such glowing praises from her fellow prospectors and miners than Nellie Cashman."²⁶

Mary Bojaniks
Goldrush Packer
Alaska/Canada
1897-1898

In the fall of 1897 news of a fabulous gold strike on the Klondike River leaked out of Alaska, and led to the legendary Klondike Goldrush. The most direct – but not the easiest way – to the Klondike was a 33-mile trail from the Gulf of Alaska, over the Chilkoot Pass to the Yukon River. Anyone who started on the trail after September was forced to wait out the winter until the river broke in the spring and they could float down the Yukon. Nearly 25,000 gold-crazed stampedeers made this trek during the winter of 1897-98. The trip meant traveling through a corner of Canada, and Canadian authorities required each stampeder to bring a year's worth of supplies. For those who couldn't afford to hire professional packers, that meant 30 or 40 trips over the 33-mile trail, hauling 60 pounds or more of gear on their backs each time. Many gave up; many died.

Twelve enterprising women were among the people who set themselves up as professional packers. They established business at a location on the trail known as "The Scales." There they "reweighed all loads, charging up to \$1 per pound to haul supplies over the summit" of the trail known as the Golden Stairs, where the trail climbed 1,000 feet in half a mile. "Here an entrepreneur actually had a handrail installed and steps chopped into the ice nightly, which stampedeers could use for a five-cent toll. One sourdough named Frank Berkeley counted 1,378 individual steps, and they constituted the biggest bottleneck between Seattle and Dawson. Everyone went the pace of the slowest."²⁷ Photographs from the time show a long line of people, all carrying huge packs, climbing the nearly vertical trail. "When traffic backed up on the 'Stairs' the packers – most hauling 100 pounds or more – would move to the side and plow ahead through the deep snow. The return trip down for another load involved a harrowing glissade through deep ice groves."²⁸

Mary Bojaniks worked as a packer that winter. A young bride from Yugoslavia, she and her husband were headed to the Yukon to find gold.

While waiting in Seattle for the boat that would carry them to Skagway, her new husband contracted a fever and died. All she had were a few pieces of clothing and one small hand-blown vase. She was advised to give up and stay in Seattle or go back home. Mary was determined to go on to Skagway. On her arrival, she was told the only way she could survive would be to marry or become a prostitute. Not liking either option, she became a packer over the Chilkoot Pass.²⁹

Other women, such as Nellie Cashman, went over the Chilkoot Trail as prospectors. One man making the trip wrote that he "could not fail to notice many instances ... in which the women showed a fortitude superior to the men. It was a revelation, almost a mystery. But after a while, I began to account for it as the natural result of an escape from the multitude of social customs and restraints, which in civilized society hedge about a woman's life.... Her nature suddenly becomes aware of a freedom, which is in a way exhilarating."³⁰

Unfortunately for Nellie and the other stampedeers, all the claims along the Klondike had been taken before the stampedeers even left home. It may be that the only people to make a fortune from the stampede were the packers and others who transported and provisioned the stampedeers through that long, hard winter.

Carrie J. Everson
Inventor
United States
Patents awarded 1886, 1892

One mining historian wrote of Carrie J. Everson, "there is probably no figure in metallurgical history about whom... so many erratic statements have been made."³¹ In

1886, Everson patented a process known as "oil flotation" which separates precious metals from ore. When many mines stopped producing high-grade ores shortly after the turn of the century, oil flotation made it possible to extract metals from previously worthless tailings. Mining historian Otis E. Young, Jr., wrote that oil flotation "was the salvation of the copper industry ... as the end of the high-grade, direct-smelting ores of Jerome and Butte came in sight."³²

There were two sources for the "erratic statements" made about Everson. The first was the story circulating through mining camps that she was a schoolteacher helping out in her brother's assay office. The second was, as Ann Macdonald noted, that "her achievement just doesn't seem credible to those convinced that only a man could be its author."³³ T. A. Rickard, writing in 1932, acknowledged that Everson did indeed receive a patent for oil flotation, but dismissed it as a "complete failure," and referred to Everson as a "pioneer that blazed no trail."³⁴ Otis E. Young, Jr., went even further, writing that

There is a charming story – unfortunately untrue – that oil flotation was first discovered by a woman... [who] patented her process and presumably made a mint. Alas for romance! Upon investigation it appears that flotation was gradually worked out by unglamorous engineers and that Miss Everson must be relegated to that apocryphal sorority which includes Peggy O'Neill, Nan Britton, Anna E. Carroll, and others who by one means or another supposedly influenced menfolk to influence American history.³⁵

According to Macdonald,

Theodore Hoover, the seminal writer on the flotation process, did allow that she had patented the process, but found a way of explaining her genius away that assuaged any possible wounds to the male ego: he chose to believe the story circulating in mining circles that she had inadvertently discovered the flotation process by laundering ore concentrate sacks in the office of her brother, a local assayer. A man, so the rationalization ran, would simply shake out the ore bags before reusing them; a *woman* would *launder* them. As she immersed the greasy ores into her washtub and agitated them sufficiently, Hoover opined several decades after the supposed event, "it only required the customary acuteness of observation of the Western lady-schoolteacher to grasp the essential facts of sulphide flotation." A very neat explanation, but for the fact that Everson was not a schoolteacher and did not have an assayer brother.³⁶

Macdonald, however, dug further, and discovered that Everson was a well-educated woman who knew a good deal about chemistry. She developed the oil flotation process in the hopes of furthering the family's fortunes, which were invested in the mining industry. Unfortunately, at the time of Everson's patent, there was no pressing need for the process. The mines were producing rich ores, and it wasn't economically feasible to extract every ounce of metal. Nevertheless, Everson found a financial backer in Thomas Criley and continued to test her process.

With her seventeen-year-old son assisting her, she conducted further experiments in Silver Cliff, Colorado, which were impressive enough to draw press attention. After seeing the Eversons' eight-hundred-gallon tank with revolving paddles and an adjustable horizontal partition, the *Denver Daily News* apprised its readers "so far, the experiments have proved a perfect success." When tested again in Baker City, Oregon, the "Criley and Everson Process" drew attention from potential investors in Portland and Walla Walla, inflating the hopes of Baker citizens looking for jobs in the demonstration plant. But Criley soon died, leaving Everson to untangle the mess of their joint affairs. After making one last stab at interesting other mining companies in her oil froth method, she finally turned her attention to another method, a dry process of flotation that she co-patented in 1892 with Charles B. Hebron in Denver.

The much-needed financial backing of another investor fizzled when she and Hebron quarreled over division of the still-to-be-earned riches from the process, and the discouraged Everson abandoned further hope of financial benefit from her patents....³⁷

After the turn of the century, however, the mines were beginning to play out, and it became worthwhile to extract the metals from former waste materials. Then the mining industry turned to the oil flotation method. Macdonald commented that when the "mining men" began to employ the Everson method "(although it pained them to admit that a woman had done something so useful as to invent the process) [they] were immensely relieved to learn that her patent had expired and no royalties would have to be paid."³⁸

In 1915, after the process had proven valuable, Colorado mining leaders wanted to acknowledge Everson's achievement, and, because she had never received any money from her invention, to gift her with a sizable amount of money. *Engineering and Mining Journal* set out to find Everson, "hoping to pierce the veil of mystery surrounding the patentee of this far-reaching metallurgical discovery,"³⁹ but failed. Denver newspapers took up the search, and eventually located Everson's only surviving son in California. Unfortunately, Everson had died two years earlier, but her son was able to recount the process she used in her research and to fill in the details of her life. He said "his mother was aware in her later years that others were earning millions by using her process to recover ore from once-worthless 'tailings' and was proud that her belief in her invention had been vindicated, even though the patent had expired."⁴⁰

Alice Hamilton

Physician, Founder of Field of Industrial Toxicology
United States
1869 - 1970

Early in her career, Dr. Alice Hamilton worked at Jane Addams' Hull House in Chicago, and was inspired to start the first baby health clinic in Chicago. While working

in the clinic, she became interested in occupational diseases. She was treating parents as well as babies at her clinic, and many were immigrants who worked at local steel mills. Many of them were dying from exposure to the steel mill fumes.

In 1910, the State of Illinois appointed her head of its new occupational diseases commission. Shortly thereafter she was hired by the federal government, and much of her research was done as a medical consultant to the U.S. Department of Labor. Hamilton was always, as she herself put it, "on the trail of lead, mercury, nitric acid, carbon disulfide, carbon monoxide, explosives, aniline dyes, benzol, and a long list of chemicals with complicated names."⁴¹

Alice Hamilton is credited with founding the field of industrial medicine. She was the first to identify silicosis, a lung disease affecting miners. "She seemed to be willing to go to any lengths for the cause. In middle age, she inspected an Arizona copper mine by riding a flimsy elevator down 800 feet, then descending an 80-foot ladder and following a guide on her hands and knees across slippery rails above open pits."⁴² She identified many other toxic substances in industry, and published numerous papers and books. Her work resulted in nearly every state adopting safety codes and worker compensation.⁴³

In 1919, at the age of 50, she was appointed professor of industrial medicine at Harvard, becoming the first woman on the faculty of the Harvard Medical School. She continued her fight for worker safety well into her eighties.

¹ Ivy Pinchbeck, *Women Workers and the Industrial Revolution, 1760 - 1850* (London: Frank Cass and Co., Ltd., 1977 (1930)), 240.

² R. Bald, *General View of the Coal Trade in Scotland* (1812), 134, quoted in Bridget Hill, *Eighteenth-Century Women: An Anthology* (London: George Allen & Unwin, 1984), 214.

³ Pinchbeck, 242.

⁴ Pinchbeck, 240.

⁵ Bonnie S. Anderson and Judith P. Zinsser, *A History of Their Own: Women in Europe from Prehistory to the Present* (New York: Harper & Row, 1988), 361.

⁶ Shulamith Shahar, *The Fourth Estate: A History of Women in the Middle Ages* (New York: Metheun & Co., 1983), 242.

⁷ Margaret L. King, *Women of the Renaissance* (Chicago: University of Chicago Press, 1991), 63.

⁸ Anderson, 426.

⁹ Anderson, 361.

¹⁰ Pinchbeck, 254.

¹¹ *Darlaston Parish MSS*, quoted in Pinchbeck, 245 footnote.

- ¹² Quoted in Michael Hiley, *Victorian Working Women: Portraits from Life* (Boston: David R. Godine, Publisher, 1980), 52.
- ¹³ Janet Horowitz Murray, *Strong-Minded Women and Other Lost Voices from Nineteenth-Century England* (New York: Pantheon Books, 1982), 370-72.
- ¹⁴ *Report from the Select Committee on Mines* (1867), iii; quoted in Hiley, 52.
- ¹⁵ Hiley, 23.
- ¹⁶ Quoted from Munby's journals, Hiley, 23. The emphasis is Munby's.
- ¹⁷ John Temple, *Mining: An International History* (New York: Praeger Publishers, 1972), 119.
- ¹⁸ Priscilla Long, *Mother Jones, Woman Organizer and Her Relations with Miners' Wives, Working Women, and the Suffrage Movement* (Boston: Southend Press, 1976), 20.
- ¹⁹ DeLysle Ferree Cass and Ryan A. Kuhn, "Annals of Womankind," in *Women's Almanac: 12 How-To Handbooks in One*, Kathryn Paulsen and Ryan A. Kuhn, eds. (New York: Armitage Press/Information House, 1976), 370.
- ²⁰ Sandra L. Myres, *Westering Women and the Frontier Experience 1800-1915* (Albuquerque, NM: University of New Mexico Press, 1982), 264.
- ²¹ Myres, 264.
- ²² "The number of women employed in mines and plantations ... dropped from 1.45 million in 1911 to under 1 million in 1971." Ruth B. Dixon, *Rural Women at Work: Strategies for Development in South Asia* (Baltimore: Johns Hopkins University, 1978), 22.
- ²³ Dorothy Schneider and Carl J. Schneider, *The ABC-CLIO Companion to Women in the Workplace* (Santa Barbara: ABC-CLIO, Inc., 1993), 16.
- ²⁴ Schneider, 16.
- ²⁵ Gill Burke, "The Decline of the Independent Bâl Maiden: The Impact of Change in the Cornish Mining Industry," in *Unequal Opportunities: Women's Employment in England 1800-1918*, Angela John (New York: Basil Blackwood, Ltd., 1986), 179.
- ²⁶ Don Chaput, *Nellie Cashman and the North American Mining Frontier* (Tucson: Westernlore, 1995).
- ²⁷ Steve Howe, "Hell Can't Be Worse Than This Trail," *Backpacker*, February, 1995, 37.
- ²⁸ Howe, 36.
- ²⁹ Dolores Wykoff, "Women of the Goldrush," *The Northern Woman Magazine*, March/April 1995, 27.
- ³⁰ Howe, 35.
- ³¹ quoted in Macdonald, 152.
- ³² Otis E. Young, Jr., *Western Mining* (Norman: University of Oklahoma Press, 1970), 233.
- ³³ Macdonald, 157.
- ³⁴ T. A. Rickard, *A History of American Mining* (New York: McGraw-Hill Book Company, Inc., 1932), 397-8.
- ³⁵ Young, 232.
- ³⁶ Macdonald, 152.
- ³⁷ Macdonald, 155-6.
- ³⁸ Macdonald, 152.

³⁹ quoted in Macdonald, 153.

⁴⁰ Macdonald, 156.

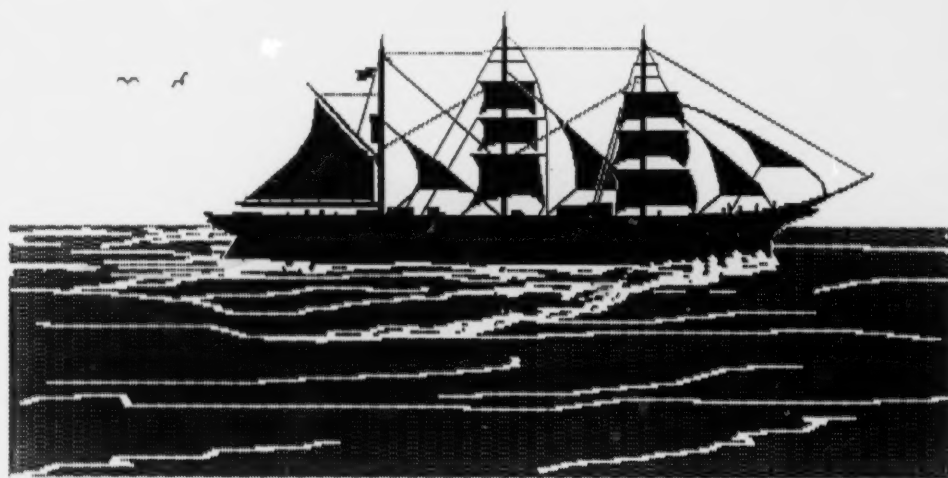
⁴¹ Lois Decker O'Neill, *The Women's Book of World Records and Achievements* (Garden City, NY: Anchor Press/Doubleday, 1978), 206.

⁴² O'Neill, 206.

⁴³ O'Neill, 206.

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Shipping / Water Transportation

Ancient

Women had strong connections with boats and shipping in a number of ancient cultures. In the mythical realm, which, as we saw in Manufacturing, may actually point to fact, the Egyptian goddess Isis was said to have invented the sail.¹ Records also show that women in ancient Sumer carried on long-distance trade in their own names. The Ring of Minos from ancient Crete shows a woman steering a ship, and another ring shows a woman disembarking from a ship, carrying a tree.²

Europe

Women were involved in water-based transportation in Europe from at least the sixteenth century. For example, Natalie Zemon Davis notes that

we do hear about *les bastelières de Lyon* ("the boatwomen of Lyon"), of whom Epistemon was reminded when he saw the knights of the Round Table rowing devils across the Styx. As the student Felix Platter reported during his visit to the city in 1552, "there are always small boats in the charge of women along the length of the quay, ready to transport you to the other shore [of the Saone]." There was no shyness about them: his boatwoman threatened to throw him in the river unless he paid his fare immediately, and then refused to give him change. The young man got his revenge by throwing stones at her from a safe distance.³

She obviously was a business woman not to be trifled with. Davis also discovered a record of one woman bequeathing a boat to another: "18 May, 1553: Estiennette Andree bequeaths a small boat, a *besche garni*, to Anthoinette Jaqueme."⁴

In England during the seventeenth century, middle and upper-class women worked as shipping agents, and some owned ships.⁵ Working class women worked as laborers. In eighteenth-century Port Isaac, Cornwall, women were employed to load slate from a local quarry onto a sloop. A contemporary observer described their work:

two or three [women] stood in a cart, and as many on the vessel's deck, tossing the slates from one to another, with an energy that quite shamed their petticoats. Their labor is immoderately hard, they can accomplish as much in a given time as men can do, and yet they receive considerably less wages, because they are women.⁶

At least one nineteenth-century woman actually had command of a merchant ship. Betsy Miller was the daughter of a man who owned several ships, and she served as "ship's husband" for him before he gave her command of the *Cloetus*. A Glasgow newspaper noted in 1852 that she had been captain for the *Cloetus* for more than 20 years and "she has weathered the storms of the deep when many commanders of the other sex have been driven to pieces on the rocks."⁷

In the early twentieth century, women worked as barge-haulers in Russia. "They were hooked into a harness, much like a team of oxen, and hauled the barge while watched by a male overseer."⁸

The Sailor's Life

In the eighteenth and nineteenth centuries, it was apparently not uncommon for women to assume male identities and find work aboard merchant marines and warships. The theme even appears in folk songs, one of which says she

*Put on a jolly sailor's dress
And daubed her hands with tar
To cross the raging sea
On board a man-of-war⁹*

It's impossible to know how many women did this; we have records only of those whose disguise was found out. Some of them served aboard ships for many years, and in some cases their true sex was discovered only when they retired or died. Linda Grant De Pauw notes that

When the records show the discovery of a woman posing as a man, they usually announce that she was therefore discharged from service. Certainly regulations forbade women enlisting as regular sailors. Indeed, one early record describes how a New York woman who enlisted as a seaman was punished, when her sex was discovered, by being dropped three times from the yardarm and then being tarred and feathered. Yet occasional evidence of females being retained in service after discovery, both in America and abroad, suggests that there was a certain tolerance for such women. We have, for instance, Nellie Bowden, whose rating on the ship's books changes abruptly from "Ship's Boy" to "Domestic" as the female first name is added. Another example is found in the record of a court-martial in which one of the witnesses was "a little female tar, Elizabeth Bowden, who has been on board the *Hazard* these eight months. She appeared in court in a long jacket and blue trousers."¹⁰

Often the woman's real name was never recorded, and she remains known to history by her male name. In the eighteenth century, one "Tom Bowling" served for over 20 years as

boatswain's mate aboard a British man-of-war and drew a pension after retirement. Her story became known when she was arrested for a petty crime in her later years.¹¹

Hannah Snell enlisted in the British Navy as "James Gray" in 1743. Her intention was to find her husband who had deserted her, leaving her pregnant and penniless. When the child died shortly after birth, Snell took on the identity of James Gray and enlisted in the army. She was charged with neglect of duty and sentenced to receive 600 lashes. She received 500 before an officer interceded. Apparently no one noticed anything unusual about this new recruit, who was also a new mother, when she was stripped to the waist for the punishment. Snell deserted and a month later joined a regiment of marines. She got on fairly well as a sailor: officers were pleased with her work and the rest of the crew teased her about not having a beard. She was seriously wounded in the leg and abdomen in one battle. "It appears that Snell kept the abdominal wound secret from [the military surgeons], allowing only her legs to be treated, and took care of the most serious injury herself with the help of a black woman of the army to whom she confessed her sex."¹² After she recovered, she was assigned to another ship, and continued in the navy until she retired in 1750. She received a government pension, and supplemented it by going on stage, where she played the roles of military and naval heroes. She later opened a tavern called "The Widow in Masquerade, or the Female Warrior."¹³

In the same period, Mary Anne Talbot went to sea, and later published her memoirs. De Pauw comments that

Like all old sailor's reminiscences, it must be taken with a grain of salt, but there is supporting evidence for most of the main details. She first went to sea in male clothing in 1792 as a servant to an officer whose regiment had been ordered to the West Indies. Later, when the regiment was ordered to Flanders, she served under the officer as a drummer. She later claimed that her service was against her will, that the officer was a villain who had seduced her and kept her with him by force. In any event, she deserted from the regiment in 1793, disguised herself as a sailor, and enlisted on a French ship that turned out to be a privateer. Talbot served as a regular member of the crew, but because she refused to fight against her own people, she said, she was severely beaten.

Eventually the privateer was taken by the English warship *Queen Charlotte*. Talbot convinced the admiral that she was on the privateer innocently and so was sent aboard the *Brunswick*, where she carried powder for the guns and was eventually promoted to principal cabin boy. On the *Brunswick* she was wounded in action in the Glorious First of June – grapeshot breaking the bone near her ankle and lodging in the thigh just above her knee. Although she was treated for these injuries by the surgeon in the cockpit and later in a hospital ashore, when she was healed she enlisted as a midshipman on board the *Vesuvius*. Either the doctors had not discovered her sex or they did not care. Once in her career she deliberately revealed her sex, after she was seized by a press gang and preferred not to embark. She eventually retired from the sea, collecting a

pension of twenty pounds a year. She joined a theater company for a while, performing male and female roles.¹⁴

Some women were very successful sailors. A black woman known as "William Brown" served eleven years aboard a British warship in the early 1800s. She held the rating of "Captain of the Maintop," an assignment given only to the most skilled and agile sailors.¹⁵ Another woman actually commanded her ship. Captain John Weed "commanded transatlantic vessels for many years", and her sex was discovered only after "he" died in a home for old sailors in 1905.¹⁶

Sailing apparently ran in the blood in some families. "One Rebecca Anne Johnson was discovered to be a female in 1808 after she served for seven years on the crew of an English coal ship.... [Her] mother had died during the Napoleonic Wars while serving with a gun crew aboard a warship."¹⁷

Pirates and Privateers

For as long as there has been shipping on the open seas, there have been pirates and privateers who made their livelihoods off the wealth of others. Pirates operated illegally, but privateers were authorized by their government during wartime to prey on the ships of enemy countries. The line between the two, between legal and illegal activity, was a fine one. In times of changing political tides, a pirate who had been on a country's most wanted list could win the commission of the government and become a privateer.

Women were active among the ranks of pirate captains. One of the earliest was chronicled by the twelfth-century historian Saxo Grammaticus. She was Avilda, daughter of the Gothic King Sypardus, in what is now Sweden. According to the history, Avilda's father arranged a marriage for her with Prince Alf of Denmark. Avilda had other ideas, and rather than submit to a forced marriage – Scandinavian women of the era were notable for their strength, both physical and mental – she gathered a crew of women and took to piracy on the north seas. They did rather well, and their fortunes increased when they overtook another pirate ship that had lost its captain. The leaderless crew asked Avilda to take command. She commanded the two ships with roughly equal numbers of women and men, and "became such a menace to shipping that the forces of law and order became aroused."¹⁸

One force of law and order who was particularly aroused by Avilda's illegal activities in his country's waters was Prince Alf of Denmark. Not realizing that his erstwhile betrothed was the fearsome pirate captain who was disrupting shipping in Danish waters, he took a ship in pursuit of the pirates. A battle ensued, and although Avilda's crew held off the royal forces at first, ultimately they were boarded and most of the pirate crew killed. When Alf finally met his adversary, he proposed marriage. For whatever reason, Avilda accepted and retired from the sea.

During the sixteenth century, two women made their marks as pirates and privateers in the British Isles. Lady Killigrew of Cornwall and her husband Sir John Killigrew came from families with long traditions of piracy, and the Killigrews worked

both as pirates and as privateers for Queen Elizabeth. In fact, Sir John had a long list of royal titles, such as Vice-Admiral of Cornwall, Royal Governor of Pendennis Castle, and President of the Commissions for Piracy. As long as they choose their targets carefully – avoiding the friends of Queen Elizabeth – the Killigrews avoided clashes with the law and were fairly respectable. Then one night in 1582, Lady Killigrew overstepped her reach: she and her crew silently boarded a rich German vessel under the protection of the crown in Falmouth harbor, killing the entire crew and taking two barrels of silver coins. The Queen was furious. Lady Killigrew and two of her lieutenants were tried, convicted of piracy and sentenced to hang. The two men were hanged, but the Queen reduced Lady Killigrew's sentence to a jail term instead. She knew she might need Killigrew's services in the future.¹⁹

The other pirate with whom Queen Elizabeth was acquainted was the legendary Grace O'Malley. O'Malley came from a seafaring Irish family that mixed piracy with legitimate activities. They had a series of fortresses along the Irish coast to protect their fleet. While still young, Grace was chosen to be her father's heir and she went to sea with him to be trained. She became an expert warrior on both land and sea, and after her father's death, took command of the O'Malley fleets and castles. She married twice and bore many children. Relations between England and Ireland were violent and unsettled, and O'Malley joined in the fray, waging her own private war against England. Queen Elizabeth put a price of £500 on her head. "English troops were sent to lay siege to one of her castles, but they could not take it; and the ships of O'Malley's fleet were so powerful that Queen Elizabeth did not dare attack them."²⁰ It is said that O'Malley's second husband convinced her to drop her personal vendetta against England, and she became an ally of the Queen.

Anne Bonney and Mary Read were two pirates who worked together in the early eighteenth century. With one "Calico Jack," they made a formidable threesome, looting and pillaging on the high seas. They were caught and tried in 1720. Sentenced to hang, Bonney claimed to be pregnant and was let off; Read also got a reprieve, but all the men of their crew were hanged.²¹

An American woman, Fanny Campbell, was one of the first to take private craft against the British during the American Revolution. Shortly before the Revolution broke out, Campbell had learned that her sweetheart, William Lovell, was in a Cuban jail, accused of piracy. The ship on which he served had been taken by pirates, and although he had escaped from the pirate ship, he himself had been arrested and charged. Campbell decided to rescue him. She dressed in men's clothes and signed aboard a British vessel as second officer, then she led a mutiny. The crew made her captain; these acts automatically made them all pirates. Several days later, they were attacked by another British ship which had suspected them of being pirates. Campbell's crew won the encounter, however, and she became captain of two pirate ships. They made their way to Cuba and successfully rescued William Lovell. On the way home, they learned that war had broken out between the American Colonies and England. With two warships under Campbell's command, they returned to Massachusetts, where Campbell and Lovell married and received formal papers commissioning them as privateers. Afterward, Campbell retired to raise a large family while Lovell continued to work as a privateer throughout the Revolution.²²

The award for greatest pirate of all time must go to a Chinese woman, Hsi Kai Ching Yih. "At the height of her career in the early years of the nineteenth century, she commanded almost two thousand ships and more than fifty thousand pirates. Because of the sheer magnitude of her operation, she must be considered the greatest pirate, male or female, in all history."²³

Madame Ching's career began when she was captured by pirates on an inland raid. The pirate leader Ching Yih chose her to be his wife. Unintimidated, she demanded "a full half share of all his property and joint command of the pirate fleet."²⁴ He agreed. She took command of two of his six squadrons and quickly became a formidable power. After her husband died in a typhoon in 1807, she took full command and expanded the pirate empire. According to De Pauw,

Madame Ching directed such a large-scale operation that, contrary to the usual practice of pirates, she encouraged written records. The great warehouse where plunder was stored was presided over by a personage known as "Ink and Writing Master." He was in charge of seeing that every item stolen by the pirates was carefully recorded in a register.²⁵

Madame Ching was also notable in that she posted regulations on every ship and boat in her fleet, including one that forbade the debauch or abuse of captive women. Each crew member was allotted a berth about 4' x 4', where he lived with his wife and children. The crew members' wives were known also to take part in the battles at sea and were pretty fierce in their own right.

Madame Ching was never defeated. The Chinese emperor, no doubt at his wit's end as to how to stop her activities in his waters, finally bought her off with an offer of amnesty, command of the imperial fleet, a palace, and high honors. She eventually retired from the sea, raising a family and living a quieter life as a smuggler.

"And from that period," writes the Chinese historian, "ships began to pass and repass in tranquillity. All became quiet on the rivers, and tranquil on the four seas. People lived in peace and plenty. Men sold their arms and bought oxen to plow their fields. They burned sacrifices, said prayers on the tops of hills and rejoiced themselves by singing behind screens."²⁶

Madame Ching must have been one very impressive pirate indeed.

Native Americans

Women in many Native American tribes were responsible for the manufacture and maintenance of canoes and other boats. The women of the Inuit Eskimo made wooden frame boats covered with sealskin, called "women's boats." These boats were used by the family for making long journeys.²⁷ The women of the Greenland Eskimos also made "woman boats" that they used for travel and fishing.²⁸

The early European fur traders were forced to rely heavily on the expertise of the Native women who joined them.

Since the North West Company had adopted the birch-bark canoe as the basis of its transport system, Indian women continued in their traditional role of helping in its manufacture. It was the women's job to collect wattappe (wattap) roots from the spruce tree, which they split fine for sewing the seams of the canoe. The numerous references in the journals testify to the vast quantities needed: "Women raising wattap - 33 women, 8 bundles each" - "Mr. Grant's Girl brought us 75 Bundles of Wattap to day." On Lake Athabasca, the women at the Hudson's Bay Company post were expected to provide an annual quota of fifty bundles of wattappe each. Having collected the wattappe, the women helped sew the seams of the canoes and then caulk them with spruce gum which they also collected. At Rocky Mountain House in 1810, Alexander Henry observed the voyageurs' wives busy gathering gum for the Columbia canoes; a brigade which departed without adequate supplies of bark, wattappe and gum for repairs could find itself in dire straits. At York Factory, the women helped pay for their keep during the winter by making canoe sails.²⁹

The women's contribution went beyond making and repairing the canoes, however.

Besides assisting in the making of canoes, Indian women, because of their traditional training, could readily lend a hand to help man them. Two women assisted in paddling the canoes on Mackenzie's voyage in 1789, but with a large force of voyageurs, it was seldom necessary for the North West Company to call upon this reserve. This was not the case with the Hudson's Bay Company in the early stages of its moving inland. With few experienced canoemen, the Hudson's Bay Company turned to women, who often rendered valuable assistance. John Thomas, on his return to Moose Factory in 1779, told of meeting another officer in charge of three small canoes loaded with provisions for an inland post; each canoe was manned by an Englishman and an Indian woman, the woman acting as steersman. In the 1790s Chief Factor Joseph Colen declared that one of the reasons for the declining number of canoes coming down to York Factory was that the women were no longer allowed to accompany their husbands and help paddle the canoes.³⁰

United States

Women were active in many "non-traditional" businesses during the colonial period. Some owned and managed wharves. The newspaper *American Mercury* ran an advertisement for goods and indentured servants to be sold at Widow Allen's wharf, and

ran a similar ad for Widow Hun's wharf in 1730. A schooner was advertised in 1768 at Mrs. Hodges' wharf in the *Essex County Gazette*. And the *Boston Evening Post* in 1763 ran an ad for Mrs. Knox at Bull Wharf.³¹

Another widow, Temperance Grant, ran her family's Rhode Island shipping business for 22 years after she was widowed in 1744.³² Elizabeth Russell worked as a shipwright in one of the Southern colonies in the eighteenth century.³³

As has been mentioned, African-American slave women were often put to hard labor. In 1800, half the diggers on South Carolina's Santee Canal were slave women.³⁴

Women in the West also took on a number of occupations that were considered unusual for women. A newspaper article published in 1872 reported that "women are gradually filling all departments of labor. The latest occupation is that of Mrs. Sarah I. Aiken, who is making postal currency and independence (i.e., her living) by rowing over the Mississippi and transferring passengers from Clinton, Iowa to Garden Plain, Ill...."³⁵

In the late 1800s, several women made names for themselves as riverboat captains. One was Blanche Leathers, who married into the Leathers family of Mississippi, which ran several of the most popular medium-sized cotton carriers on the lower river. After Blanche received her pilot's license in 1894, she often commanded the boat.³⁶

Mary Becker Greene was the first woman riverboat captain on the Ohio River. The Cincinnati-based Greene line of packet boats was started in 1890 by Mary's husband shortly before they married. She learned navigation from her husband and earned her pilot's license in 1893.

The *Argand* was then purchased and she became its master and pilot. She was so successful that she banked over two thousand dollars at the season's end. The Greene Line attained its success at a time when towboats and railroads forced many packet lines out of existence. In its heyday, the line ran eleven boats in the Ohio and its tributaries. Captain Greene died in 1927, and his wife and two sons continued the business. They purchased the old Mail Line, and the business improved so well that more boats were added in the 1930s.³⁷

Mary Greene continued to captain her boat on the Ohio for fifty years.

Another woman captain was Lillian McGowan, who commanded the *Marengo*, a six-hundred-ton schooner carrying cargo in the Great Lakes.³⁸ An article published in 1906 described McGowan as "at the ripe age of sixteen, with her hair falling in a braid down her back, careless of the fripperies of her sex and youth, [she] can not only give orders to the crew about her as to the proper passage and landing of the vessels, but when her orders are not executed promptly enough, can turn to and execute them herself."³⁹

Navigation is an essential skill aboard ships, and it was the domain of many captain's wives during the nineteenth century. "Some wives in the merchant marine signed the ship's articles as officers. One wife, who was knowledgeable about navigation and ship's business in general, signed on as purser for the wage of a shilling a month."⁴⁰ In coastal New England during that time, navigation was considered a necessary part of a girl's education. "For instance, Dukes County Academy on Martha's Vineyard advertised

navigation as one of the subjects offered by its 'female department' in the 1830s. In addition to drawing and painting, which were generally encouraged feminine 'accomplishments,' the academy gave 'particular attention' to projection, drawing, and coloring maps."⁴¹

With the skill of navigation also came the possibility of command, especially in an emergency. De Pauw explains:

Hauling lines and setting sail to keep the ship moving was important; so was physical intimidation of the crew, who were always somewhat unwilling captives on a voyage. Yet unless someone aboard knew the ship's location and how to plot a course to its destination, no amount of hauling lines and cursing sailors would prevent catastrophe. Thus, when a captain was disabled and his wife was the best navigator on board, command of the ship would most naturally fall to her. Mrs. Reed, the wife of the captain of the *T. F. Oakes*, was not only a proficient navigator but a better hand at the wheel than most of the men aboard. The ship was in trouble in 1897, with her husband sick, the first mate dead, and a good part of the crew dead or dying of scurvy. She took command and saved the ship. To honor her achievement the famous nautical insurers, Lloyd's of London, gave her their prestigious Silver Medal.⁴²

Daisy May Godfrey married a tugboat captain in 1911, and set up housekeeping on the boat. "After she earned her navigator's license, Captain Godfrey signed her on as second mate. She continued to study and eventually earned a master's license. During World War II the Godfreys were on board an ocean-going tug that was part of the Moran fleet. Once they were caught in Boston Harbor for several hours during a U-boat scare while the submarine nets were down. Daisy May Godfrey was awarded the North Atlantic Star and the Merchant Marine Bar."⁴³

The Clipper Ships

The most challenging and coveted commands of the nineteenth century were on the great clipper ships, those sleek and fast merchant ships that vied to set speed records for the journey from the East Coast, round Cape Horn to California or China. Often several clippers would set sail at the same time, and the greatest prizes went to the one that arrived first. Several women who were captain's wives distinguished themselves as navigators and two actually assumed command in emergencies.

Eleanor Creesy
United States
1851

The wife of Captain Josiah Perkins Creesy, Eleanor Creesy always served as her husband's navigator. She navigated the maiden voyage of the clipper *Flying Cloud* from Boston to San Francisco in July 1851. *Flying Cloud* was the largest and fastest clipper yet built, and made the trip round the Horn to San Francisco in record time, bettering the previous record by more than a week, despite battering by constant storms and sabotage by two members of the crew. Her navigation brought the ship through the doldrums in only four days. Later,

Mrs. Creesy, her arms hugging the sides of her swaying chart table, told her husband that they had better alter course. By her calculations the point of Cape San Diego lay dead ahead, and the weather was too thick to sight the land in time to veer off. The rain that had come on with the northerly wind had turned to sleet and was rapidly developing into a blizzard. Creesy sent the *Cloud* northward, away from the rocky cape, and called for furled courses; however, he left the topsails up, close-reefed so that, as the ship sank into the valleys between the huge waves, these upper sails would hold the wind and keep the ship under way and maneuverable.

The *Cloud* was fairly in Cape Horn weather now. The snowstorm continued throughout the 20th as the ship zigzagged back to the south. The winds drove the snow across the deck in nearly horizontal sheets, piling drifts on the leeward sides of the deckhouses. The next day the temperature moderated a bit and the snow turned to rain. But, as Creesy noted, there was a "bad sea Running" and the *Cloud* was shipping water across her deck. Then, on July 22, the skies cleared. Ten miles off her starboard bow stood Cape San Diego, a black band of granite over the slate-gray sea. Mrs. Creesy's dead-reckoning navigation was exactly on target.

Rounding Cape Horn, Mrs. Creesy

had navigated the clipper so well that she had not gone much farther south than 56°, well north of the course that most ships took round the Horn. By noon of July 26 the *Cloud* was at lat. 50.57°, romping up the western coast of South America in a fine breeze under clear skies. Her transit of the Horn had been remarkably swift. Many ships spent weeks and sometimes even months making good the same distance she had covered in just three days.⁴⁴

Hannah Burgess
United States
1852

Hannah Burgess looked like a poor candidate for a seafaring woman, puking up her honeymoon dinner as she clung to the rail on the short ferry trip between Cape Cod and Boston. It was 1852, and she had just married Captain William Burgess. Three months later, he assumed command of the clipper ship *Whirlwind*, and was gone for a year. Not wanting to endure another long separation, Hannah Burgess was determined to go with him on the second voyage.

And wonder of wonders – on the great ocean-going clipper, Hannah Burgess was not seasick at all! Hoping only to avoid the unhappiness the separation from her husband caused her, she discovered that seafaring life suited her marvelously well.

Within a few weeks at sea her journal took on a more businesslike form, recording the names of the officers and the number of men in the crew. She studied books on navigation and took lessons from her husband; after a month at sea the captain trusted her readings and calculations enough to turn over navigation of the *Whirlwind* entirely to her. She also "learned the ropes," so her journal contained such entries as, "At 2 P.M. word ship offshore, at 8 closereefed topsail, split the foremast staysail, unbent it and bent new one." The trickiest part of the voyage was always the westbound passage around Cape Horn, where gale-force winds fought the progress of the ship every mile of the way. Even then, Hannah Burgess did not complain of seasickness. Indeed, on one wild Sunday night when the force of the storm split a sail, she wrote, "I should like to have been on deck even though it meant being lashed to the rigging."⁴⁵

After this voyage, Captain Burgess was given command of the *Challenger*, an even larger clipper. There was no question that Mrs. Burgess would go to sea again. "By this time she was a first-rate navigator. Her husband and every officer on the ship agreed that she was as good as the best captain sailing."⁴⁶ When they had been at sea nearly eighteen months, Captain Burgess fell ill and was put to bed. Hannah Burgess and the first mate held a conference, and they agreed that she would take command of the ship. The nearest port was Valparaiso; they decided to make their way there. Twenty days later, Captain Burgess died. The ship arrived in Valparaiso four days later. Hannah Burgess had been in command for over three weeks.

Mary Ann Patten
United States
1856

On November 15, 1856, the clipper *Neptune's Car* arrived in San Francisco with the captain's wife in command. Mary Patten had commanded for fifty-two days, successfully navigated the difficult passage around the Horn, and dealt with serious problems of discipline as well as a dying husband. When she took command she was nineteen years old and four months pregnant.⁴⁷

At the age of sixteen, Mary Ann Patten married Joshua A. Patten, captain of the clipper ship *Neptune's Car*, and went to sea with him.

It was obvious from the beginning of her first voyage with him that she would be a useful addition to the ship's company. The captain went so far as to make a notation in his log that "Mrs. Patten is uncommon handy about the ship, even in weather, and would doubtless be of service if a man." As it was, his wife helped dispense medicines, cooked, and took instruction in navigation. By the end of the voyage it was agreed that Mary Patten could easily pass the examination for a masters' certificate."⁴⁸

It was on her second voyage that Mary Patten captured the attention of the world. *Neptune's Car* left for San Francisco on July 1, 1856 in a race with two other clippers. Fast passage times meant more money to captains and ship owners, and the competition was fierce. So fierce, in fact, that some resorted to sabotage to undermine their opponents. Before *Neptune's Car* set sail, there had been newspaper reports that a competing line had placed a saboteur on the crew of one of the three ships. It appeared that the chief's mate of *Neptune's Car* was the saboteur. "He was insubordinate, abused the crew, and the captain discovered that he pulled in sail when he had the watch, to slow the ship, and slept on duty."⁴⁹ Before long, the chief's mate, Keeler, was put in irons and the captain took over his watches. The second mate was unable to fill the position because he was illiterate and didn't know navigation.

Captain Patten was on deck round the clock as *Neptune's Car* neared the Horn. Exhaustion overtook him, his eyesight and hearing failed, and raving with fever, he was put to bed. Keeler demanded to be released to take command.

Mary Patten disagreed. She had the support of the second mate and believed the crew would trust her more than an officer who slept on his watch. She sent a message to Keeler, telling him that her husband did not trust him when he was well, and she would not trust him now that her husband was sick. Keeler attempted to rouse the crew to mutiny, but Mary Patten had correctly assessed the situation. She made a speech to the crew, assuring them that she could get them safely to San Francisco as long as she had their support, and they believed her.

Then they took on the Horn. For fifty nights Mary Patten slept in her clothes. During one forty-eight-hour period she was constantly on the quarterdeck, wearing oilskins for protection against the spray and watching anxiously for the moment, which must be seized immediately, when it would be safe to hoist some sail.⁵⁰

As she guided the clipper through one of the worst storms ever recorded off Cape Horn, the sailors followed her orders without hesitation. "Each man," reported one observer, "vied with his fellows in the performance of his duty."⁵¹

As well they might. Their lives were in her hands, and they knew it.

After the passage round the Horn, Captain Patten's condition improved somewhat, and although he was still bedridden, he gave orders to release Keeler. No doubt he was still under the influence of the "brain fever," for it was a major error.

Exactly what happened is not clear, but Keeler appears to have attacked the captain's wife. The men on watch heard cries and were told there had been a "dreadful accident:" Keeler was lying across the entrance to the cabin with a lump on his forehead. It was also discovered that Keeler had changed course; instead of continuing the race to San Francisco, he had given orders directing *Neptune's Car* to the port of Valparaiso.⁵²

Keeler was locked up once again, and turned over to the authorities when the ship reached San Francisco.

Meanwhile, there was still a race to win. Mary Ann Patten "crowded on sail; one day *Neptune's Car* logged over three hundred miles. Then, heartbreakingly, with San Francisco only a few days away, the winds failed and the ship lost ten days when the sails were useless.⁵³ *Neptune's Car* had once made the voyage from New York to San Francisco in 97 days; this passage took 136, but it was a respectable time nonetheless. Mary Ann Patten's ship placed second in the race.

When *Neptune's Car* arrived in San Francisco harbor, the world was fascinated by the story of the young woman who had done what no woman had done before. The insurers of *Neptune's Car* sent her a check for \$1000 as a reward for saving the ship. She modestly replied, "I fear you have overestimated those services. Without the hearty cooperation of the crew, the ship could not have arrived safely."⁵⁴

Four months later, she gave birth to a son, and several months after that, her husband died, probably of tuberculosis. Mary Ann Patten came down with tuberculosis herself some time later, and died at the age of twenty-three. One writer wrote that "no other clipper wife was more beloved, or more courageous, than Mary Ann Patten,"⁵⁵ and another called her "the outstanding woman in the history of the U.S. Merchant Marine."⁵⁶ The hospital at the Merchant Marine Academy at Kings Point, New York, bears her name.

Lighthouse Keepers

Although keeping a lighthouse was generally regarded as a male occupation, at least 138 women received official appointments in the lighthouse service. Another 240 women were appointed assistant keepers. Most were widows or daughters of former keepers, beginning with Hannah Thomas at Plymouth Light on the Massachusetts coast in 1776, who took over when her husband went off to fight the British. Keepers lit a number of lamps at dusk, replenished the fuel or replaced them at midnight, and every morning polished the lamps, the lenses, and the lantern glass to keep their lights shining brightly. The last woman lighthouse keeper was Fannie Salter, who tended the Turkey Point Light on Chesapeake Bay from her husband's death in 1925 until 1947. Automation by the U.S. Coast Guard has now made lighthouse keeping obsolete.

In the nineteenth century lighthouse keeping was very much a family affair, and the lighthouse service made use of the free labor families could provide. Keepers were often responsible for other aids to navigation, which took them away from their stations. They were permitted to pursue other jobs, such as fishing or farming. Family members learned to keep the lights burning while the keeper was away. When a male keeper fell ill or died, his wife or daughter often simply took over his duties until another keeper arrived, or accepted official appointments themselves.

Kate Moore was an outstanding example. Her father sought the keeper's appointment at Black Rock Light off Bridgeport, Connecticut, after being injured in a fall. Kate was twelve when he took her to Black Rock in 1817. She learned to tend the lamps for him, and kept that light until he died in 1871. She then became official keeper at age 76, and kept the light until she retired at age 84. In all those years she had also tended a large garden, kept chickens, sheep, and a cow, carved duck decoys to sell, and seeded and harvested oysters in Long Island Sound. In 1889 Kate told a New York Sunday World reporter that she did not find the life particularly hard!

Some women had no previous lighthouse experience. Harriet Colfax, who tended the Michigan City Light on the Lake Michigan shore of Indiana from 1861 to 1904, received her appointment through political influence (as did a number of men), and recorded in a most entertaining log her harrowing experiences lighting a beacon at the end of a long pier in stormy weather. Emily Fish was a widow when her naval officer son-in-law arranged her appointment to tend Point Pinos Light on Monterey Bay in 1893. Juliet Nichols was the widow of that same naval officer when she received an appointment in 1902 to keep the Angel Island Light in San Francisco Bay. She frequently struck the fog bell by hand when the

mechanism broke down. Mary and Helen Smith, the first keepers (1874) at the Point Fermin Light in California supposedly applied for the job hoping that the exercise climbing up to the lantern would improve their health. Eight years later they decided that life on Point Fermin was too lonely for them.

Lighthouse keepers in the nineteenth century faced much danger and performed heavy physical labor, and the women who tended the lights met the demands. Ida Lewis at Lime Rock Light was decorated for the rescues she performed in hazardous winter weather. Kate Walker at Robbins Reef Light and Margaret Norvell at Point Pontchartrain Light launched wooden dinghies to pull shipwrecked mariners off the rocks around the lighthouses. Abbie Burgess at Mantinicus Rock Light, Maria Youngmans at Biloxi Light, and Harriet Colfax at Michigan City Light were among the women who stayed at their posts to keep the lights burning during fierce storms and hurricanes.⁵⁷

Inventors

Sarah Mather received patents in 1845 and 1864 for a submarine telescope which incorporated a lamp. Anne Macdonald called it a "truly remarkable submarine lamp and telescope used to illuminate the ocean depths"⁵⁸ and Matilda Joslyn Gage, in *Woman as Inventor*, sung its praises:

The deep-sea telescope ... is a unique and important invention, bringing the bottom of the largest ships to view without the expense of raising them into a dry-dock. By its means wrecks can be inspected, obstructions to navigation removed, torpedoes successfully sought for, and immense sums annually saved to the marine service.... We deem the telescope which examines the heavens a wonderful invention ... but how much greater the scientific genius must these women possess who have invented an instrument for bringing into view the depths of the ocean, and making its wonders as familiar to us as those of dry land.⁵⁹

Several women patented devices for raising sunken ships. In 1865, Temperance P. Edson received a patent for a waterproof container that could be inflated by means of a spring and tube system that drew in air from the surface, providing a multipurpose flotation device.⁶⁰

Emily Tassey also patented an apparatus for raising sunken vessels in 1876. In all, she received five boat-related patents. One patent covered a method of propelling water from the bow of a boat to the stern, simulating a water jet.⁶¹ Other patents were for siphon propeller pumps and an improvement in dredging machines.

Hannah Mountain invented a life-saving device which she patented in 1873. Her "mattress," which was made of deer hair or cork shavings, was designed to be effective

regardless of which side was up when it was thrown into the water. The device was approved as an auxiliary lifesaving appliance instead of boats or rafts by the United States Supervising Inspectors of Steamboats.⁶²

Amanda Theodosia Jones, best known for her patented food canning techniques, also ventured into the field of fuel oil. A problem facing the new oil fields in Pennsylvania was to find a way "that drillers could safely burn the crude oil they were extracting without risking hideous accidents. [If that could be done], oil would become a reliable fuel for industry."⁶³ Jones invented and patented an "Automatic Safety Burner,"

a kind of safety valve to control the amount of oil released from the pipe (or other container), [that was] so ingenious to the five hundred men who watched her demonstration that, she reported, they "stood around agape." The United States Navy, then hoping to use the oil to replace coal in powering its ships but reluctant to do so because of the danger, grasped the potential of the safety burner and bestowed official praise upon it.⁶⁴

That recognition enabled Jones to get a generous contract with a wealthy partner for the development of the burner. Unfortunately, her partner lost everything in the Stock Market, and she was forced to try marketing the burner without financial backing. Although she never lost faith in the burner, she was not able to make a commercial success of it.

In 1896 a patent was granted to Sophia Barre for an electric running light and signal lantern for ships. Florence Parpart invented a collapsible boat, and sold several hundred to Klondike prospectors.⁶⁵

Martha J. Coston
Inventor, Signal Flare
United States
1826 - ?

Martha J. Coston was a classic example of making lemonade from the lemon life handed her. Married at the age of sixteen to a young inventor, they soon moved to Washington, D.C., where he worked for a navy research laboratory and she thrived on the whirl of social life in the nation's capitol. When Coston was only twenty-one, her husband died, leaving her a widow with four children and a bankrupt estate.

After collecting his things from the lab, she discovered among them the prototype plans for signal flares. A great idea, but he had never been able to get the signals to work successfully. Coston decided that she would bring the concept to fruition, and find a way to support herself and her family.

She spent several years working with chemists, experimenting and testing the flares. It took nearly a decade to perfect flares that burned with a vivid red or bright white chemical fire, but she needed a third color to complete the standard maritime codes. Her

heart was set on blue, she later wrote, to represent the colors of the American flag, "but I could not obtain it with equal strength and intensity to the others."⁶⁶ The breakthrough came when she was watching the huge fireworks display staged in honor of Cyrus Field and the first transatlantic cable. She began corresponding with pyrotechnic experts – under her initials so they would not know she was a woman – and eventually hired one of them to help solve the problem of the third color. They were not able to develop a satisfactory blue, but they did develop a green flare that met the specifications.

Coston patented the flare in her husband's name, with herself listed as the "administrix" of his estate in 1859. Technically, though, since patent law defines the inventor as the person who "reduces the idea to practice," she most certainly qualified as the inventor. Her second patent, a device to launch the flares, was issued in her own name in 1871.

The signal flare proved a great success and "was instrumental in winning the Civil War for the North: it enabled battleships to communicate strategic information over long distances, and it saved the lives of thousands of seamen by preventing or pinpointing shipwrecks."⁶⁷

Coston went on to patent the flares in nearly every maritime country with patent systems, and marketed it successfully in the United States and Europe. She lived in Europe for a time, where she socialized with royalty. Her marketing efforts made her quite wealthy.

Unfortunately, the world today knows the Coston flares as the "Very Pistol," after Lieutenant E. W. Very, "who patented some minor refinements to the signal's delivery system long after the device was in use."⁶⁸ Coston's fondest wish was to see the Coston name back on the flares, but this never happened.

World War II and After

In England, Norway, and Russia during World War II, women served in the merchant marine. The Soviet Union even included women in their amphibious combat force. One notable example of a woman who contributed to the war effort at sea was Victoria A. Drummond of Great Britain, a qualified engineer who served as second engineer on the merchant marine SS *Bonita* during the war. She received the M.B.E. Lloyd's Silver Medal, the Coronation Medal, the war medal, and five campaign stars for her outstanding service. The official citation from Lloyd's reads:

The ship was attacked for thirty-five minutes by a bomber when four hundred miles from land but by skillful handling many hits were avoided. When the alarm was sounded Miss Drummond at once went below [to the engine room] and took charge. The first salvo flung her against the levers and nearly stunned her. When everything had been done to increase the ship's speed she ordered the engine room and stokehold staff out. After one attack the main injection pipe, just above her head, burst a joint and

scalding steam rushed out. She nursed this vital pipe through the explosion of each salvo, easing down when the noise of the aircraft told her that bombs were about to fall, and afterwards increasing the steam. Her conduct was an inspiration to the ship's company, and her devotion to duty prevented more serious damage to the vessel.⁶⁹

Virginia Drummond continued her career at sea after the war, and served as chief engineer on the ships of several countries.

Canadian-born Fern Blodgett worked as a wireless operator aboard the Norwegian cargo ship *Mosdale* during World War II. "The *Mosdale* was later to hold the record for more wartime crossings (98) of the Atlantic than any other Allied ship, and Fern Blodgett was aboard for most of them."⁷⁰

All American women were beached during the war. The National Maritime Union had only 400 women members at the time, but it still supported their efforts to return to sea as radio operators, cooks, storekeepers, and pursers' clerks.

Although these women sailors were making more money in new jobs as welders or aircraft mechanics than they would at sea, they were more than willing to take a pay cut to get closer to the action. When twenty-two year old Irene Walker was asked why she was willing to give up a job paying four times what she had earned at sea, she answered simply that she and her friends "thrive on danger."⁷¹

Their enthusiasm notwithstanding, no women, whether in the coast guard, navy or merchant marine, were allowed to work at sea on American ships during World War II.

They were – grudgingly – allowed to build ships, however. The wartime labor shortage compounded with the need for increased production in heavy industry, forced the government and industry to recruit women fill production jobs. Katherine Archibald, who worked as a steamfitter at one shipyard, studied the social dynamics created by the changing labor force, and wrote about her observations in *Wartime Shipyard: a Study in Social Disunity*. She wrote, "a typical pattern was established at Moore Dry Dock. Here, women were beginning to intrude into the actual work of construction by the late spring of 1942, first as welders, then as laborers and electricians, and finally, in a growing stream, into almost all the crafts of shipbuilding."⁷² Archibald's observations are discussed in detail in the Metal section.

After the war, European women continued to work at sea, especially on ships flying Eastern European flags. There were women officers and even women captains. They were becoming numerous enough to "irritate male sailors who accepted women on the crew in traditional roles."⁷³ Hazel Zuckerman, a woman who had worked on American cruise ships after the war and found herself out of work when the American cruise ships disappeared, commented that in the 1970s, "Women had long been working on foreign ships. I've met Swedish women working cargo vessels and whatever kind of vessels were around. The Norwegian women were working; the Russian women were working; they were all working – but not the American women."⁷⁴

Zuckerman led a delegation of unemployed women sailors to Washington, where three women members of the House of Representatives arranged for them to meet with Admiral Bender of the coast guard. Apparently Bender said the reason for keeping women off the ships was the lack of separate toilet facilities. Zuckerman countered with the news that airplanes didn't have separate toilets, and neither did her family as she grew up. She even got Bender to admit that his family didn't, either, and that it hadn't been a problem. Apparently that convinced him, and women began working on merchant marine vessels again.

A woman headed the engine room "black gang" of the Great Lakes iron ore freight *John S. Dykstra* in 1977.

Maritime schools began to recruit women students, and in 1974, the Merchant Marine Academy at Kings Point, NY, became the first of the federal military service academies to accept women. Admiral Elmo Zumwalt predicted in 1972 that women would eventually find a full place in Navy service, but it took a court order from Judge John Sirica in 1978 to get women back on Navy ships, where they served well. The captain of the repair ship U.S.S. *Vulcan* said of his experience of taking the ship through a storm in the North Atlantic "with a female helmsman, a female quartermaster-navigator, a female phone talker – even a female officer of the deck – and I was as comfortable and at ease with them as I have ever been in a storm with any ship."⁷⁵

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⁴ Davis, 195.

⁵ Ann Oakley, *Woman's Work: The Housewife, Past and Present* (New York: Vintage Books, 1974), 19-20.

⁶ Richard Ayton, *A Voyage round Great Britain*, vol. 1 (1814), 28, quoted in Bridgit Hill, *Eighteenth Century Women: An Anthology* (London: George Allen & Unwin, 1984), 221.

⁷ Linda Grant De Pauw, *Seafaring Women* (Boston: Houghton Mifflin, 1982), 183.

⁸ Rose L. Glickman, *Russian Factory Women: Workplace and Society, 1880 - 1914* (Berkeley: University of California Press, 1984), 32.

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LAND TRANSPORTATION / ANIMAL OR HUMAN POWER



Land Transportation / Animal or Human Power

Europe

Women appear to have been involved in transportation from the earliest times. There is a reference to a freewoman in 4th century Athens who was employed as a horse tender.¹ In mid-fifteenth century Strasbourg, women were named on the lists of licensed wagoners.² But probably the most common work of European women in land transportation was as load carriers to and from markets.³ Pinchbeck quoted one writer who commented that

"The number of women (mostly from North Wales) who are employed by the farmers and gardeners round London, during every summer season, in weeding and making hay, in gathering green pease and beans, in picking fruits and carrying strawberries and other tender fruit to market is astonishing. Their industry is unequalled in Britain, or perhaps in the world. The fruit women will labor several hours in the garden, and go to and from the London markets twice a day, though at from four to seven miles distance." Such fruits as apples, pears, cherries, plums, walnuts, raspberries, strawberries, gooseberries and currants were gathered by the measure and carried to London by the journey. Their hours of labor were in the summer from 6 a.m. and in the winter from light to dark...⁴

United States

Labor shortages during the colonial period and the settlement of the West provided women with opportunities for transportation work. In the southern colonies of the eighteenth century, a woman named Martha Clifford ran a livery stable.⁵ Another woman who lived in the West in 1870 was listed in the census as a wheelwright.⁶

Many pioneer women got lots of experience driving wagons. A number of women were forced to drive wagons, at least for part of their overland journey. Some didn't appreciate the opportunity. "My husband was taken sick and I had to drive the team," one woman wrote. "At that time there were nine women who were driving – not well men enough in the company to drive the teams. Well, that was a sad day for me. I had never done anything in that line and was very awkward."⁷ Some women, however, were proud of their new skills. Lydia Waters learned to drive an oxteam on the trip out the Platte, and boasted of her ability to handle a heavy wagon.⁸

A few women used their skills for gainful employment as bullwhackers (freight haulers) and stage coach drivers. About some of these women, we know tantalizingly little: one writer simply mentions that "a gal called 'Snapping Annie' was a bullwhacker." Another woman known only as Arizona Mary earned a mention in at least three books.

She drove a sixteen-yoke ox team carrying freight in the Southwest,⁹ and according to one writer, accumulated "a sizable fortune."¹⁰

Priscilla Marks commented that bullwhacking was "perhaps the most startling independent trade pursued by women," and described two of them:

A young Spanish woman in the Weatherville area in California owned a mule packtrain and bought and loaded goods herself. A woman known as Madam Canutson freighted to Deadwood with her own ten-yoke oxtteam, her freighting skill garnering the admiration of other bullwhackers.

Most of these entrepreneurial women were wives and mothers. A Weatherville merchant ready to propose to the young Spanish freighter was told "she had a husband somewhere in the mines" and a five-year old child. Madame Canutson, whose husband was homesteading ranch land for the family, carried her baby with her on a six-week freighting job between Pierre and Deadwood, referring with pride to the "awful toney bed" she had created for him in the oven of a stove being hauled in for a hotel.¹¹

This was presumably the same Mrs. Knutson described by another writer as "one of the few female bullwhackers in the West. Her husband worked a homestead claim, while she, 'too weak to farm [!],' carried her baby and drove freight into Rapid City."¹²

Martha Canary, also known as Calamity Jane, was also a bullwhacker. An edition of the *Sidney Telegraph* reported that she had arrived from the Black Hills and had been promoted to "assistant wagon boss." Charles Fales, who was considered an authority on the subject of bullwhacking, recalled seeing her as a whacker off and on over a period of time, and an old mule skinner was quoted as saying, "I worked with Jane on three freight trips with a bull string. She took her place as any man would, and did her share of the work with the best of them."¹³

A woman known as Mountain Charley, who passed as a man for 13 years in order to support her child after the death of her husband, ran an overland freight business for part of that time.¹⁴ Mary Fields, a former slave who was written of more extensively in the section on mail carriers, began her career as a freight hauler for the Ursuline convent in Cascade, Idaho.

"During the Civil War, when the Texas port was blocked," Texas rancher Sally Skull "bossed freight wagons with supplies from East Texas to ports in Mexico." A historical marker dedicated to her stands near the town of Refugio. It reads:

Woman rancher, horse trader, champion "Cusser." Ranchesd NW of here. In Civil War Texas, Sally Scull (or Skull) freight wagons took cotton to Mexico to swap for guns, ammunition, medicine, coffee, shoes, clothing and other goods vital to the Confederacy. Dressed in trousers, Mrs. Scull bossed armed employees. Was sure shot with the rifle carried on her saddle or the two pistols strapped to her waist.

Of good family, she had children cared for in New Orleans school. Often visited them. Loved dancing. Yet during the war, did extremely hazardous "man's work."¹⁵

Legend also has it that Mother Jones, the (in)famous union organizer, briefly worked as a mule driver so that she could replace her dead husband as an organizer in the mines. It's not known for certain if this is true, but it appears to have been a story she told.¹⁶

Women also drove stage coaches. Mary Fields and Mrs. William Mannix, both mentioned elsewhere in this history, drove stages that carried mail as well as passengers. Sarah Jane Creech Orchard, who worked as an actress in England, immigrated to the United States around 1885, and soon moved to New Mexico. She married James W. Orchard, who owned the Mountain Pride Stagecoach Line. She often drove the stage, and spoke proudly of the company:

We have sixty-five handpicked horses, also an express wagon and two yellow and red Concord stages. The Concords were built by the Abbott-Downing Company in Concord, New Hampshire. Each weighed twenty-five hundred pounds and was sturdily built. Nine passengers rode inside on padded leather seats and six others could perch on top with the luggage. There was also a leather boot (storage box) on the back of the stage. They surely played a vital part in the settling of the West.

Our time schedule called for the stage to leave Kingston at six o'clock. I drove often. I could handle the four horse team and the heavy stage from the high driver's seat on top of the front of the stage and I could kick the foot brake with the very best of them! I recall one time renegade Indians ... appeared suddenly in the road right in front of the stage. I kicked the foot brake on quickly and pulled hard on the reins to stop the horses.

It made me so mad! I knew they wanted to steal my horses. I didn't stop to think, I just lit into them with all my might, flaying about with my bullwhip and screaming at the top of my voice. The Indians were probably shocked or amused that such a small woman could make so much noise and do all that damage. Believe me, they really scattered."¹⁷

Orchard had a reputation for being a hard-hearted business woman who also grew flowers to decorate graves that would have gone unnoticed, and used funds from her brothels and hotels to build a church.

Clara Brown
Wagon Train Owner
United States
1803 - ?

Aunt Clara Brown was a former slave who had purchased her freedom and settled in Central City, Colorado, where she became a leading citizen. She made a fortune by

running a laundry, charging fifty cents per shirt. By 1866, she had saved ten thousand dollars. After the Civil War, she searched unsuccessfully for her family. "She located thirty-four other relatives whom she took to Leavenworth by steamboat and then purchased a wagon to bring them across the plains to Denver."¹⁸ That was the first of Clara Brown's wagons. She invested nearly all of her savings in her own wagon train company which transported "blacks from the post-Civil War South to safety in the West. Her wagon trains were manned entirely by freed slaves."¹⁹ She is remembered still in Central City for founding the first church, and for helping any one in need, black or white.

Charlie Parkhurst
Stagecoach Driver
United States
1812-1880

The most famous woman stagecoach driver was Charlie Parkhurst, who "achieved distinction in a physical occupation that called for nerve, courage, endurance, and coolness - qualities arrogantly claimed to be exclusively masculine."²⁰ It is also a recorded fact that Charlie Parkhurst registered and voted in the Santa Cruz County election in 1868, becoming the first woman to ever cast a ballot in the United States. That feat was made possible by the fact that Charlie passed as a man, and her true gender wasn't discovered until after her death.

Born in 1812 in New Hampshire, Parkhurst (whose real name might have been Charlotte), grew up in a Massachusetts orphanage. At the age of fifteen, she put on boy's clothes and went to work for a Worcester, Massachusetts, stable owner named Ebenezer Balch. She worked hard, cleaning stables, pitching hay, caring for the horses. Balch "taught her to drive a team, then a four, then a six, and when still in her teens she is said to have been an expert with six heavy leather reins between her fingers."²¹ While working for Balch, she met two wealthy men who later started one of the first stage lines in the West. They invited her to work for them, and she moved to California in the early 1850s.

A man named Farish wrote of riding with her on the stage from Knight's Ferry to Stockton, a route she drove for 20 years. He said "she was as good a driver as could be found.... About 1870 I made the trip with her. She was quite tall, broad shouldered and compactly built. Her face was much bronzed from exposure and she spoke in a rather masculine falsetto voice." Farish also said that

her skill as a driver was equal to that of any of the men but that she had nerves of steel and was braver than most of them. In support of such statements he says that she was driving across the Tuolumne River in high water when she sensed that the bridge was being carried away from under her, and so "sharply plied the lash to her faithful animals, who sped forward with a bound only reaching the other shore as the bridge was swept away...." He is also the source of the story that when stopped by road bandits and told to throw down the express box she threw it down, but said, "The next time

you come to rob me I'll be fixed for you." Two weeks later when armed men tried to take the box "she shot the leader, applied the lash to her horses and escaped without harm. The body of the highwayman was found by a searching party in an old tunnel near the scene of the shooting."²²

Parkhurst suffered from rheumatism in her later years and retired as a driver. She bought a ranch in Salinas Valley where she lived alone. After she died there in 1880, the people preparing the body for burial discovered that she was in fact a woman, and the story was a sensation in newspapers across the country from California to New England.

Inventors

Schoolmistress Clarissa Britain of Michigan turned to inventing during the Civil War. Among her patents was one for an improved ambulance. According to Ann Macdonald,

She was obviously aware of the difficulty of maneuvering ambulances onto the battlefield and thus designed what she described in her patent as a "safe, cheap, and comfortable" ambulance whose framework, compactly collapsed, could be hauled to the site and re-erected on top of wagon bodies the army used to transport the sick and wounded. Bearers could remove the stretchers from the racks, load the wounded onto them on the battlefield, and, without transferring the injured, return the stretchers to their slots in the ambulance framework and thus avoid unnecessary jostling.²³

Annie H. Chilton received patents in 1891 for two types of "horse detacher and brake" devices for unfastening a carriage from a runaway horse and preventing the carriage from turning over or breaking shafts after the horse was detached.²⁴

One of the drawbacks to horse-drawn transportation in the cities was sanitation. Horse droppings were a major urban problem, and two women turned their considerable talents to solving the problem. The first was Cynthia M. Westover (later, Alden), who grew up in the West with her father, a noted geologist. "She rode, fished, swam, and became such a crack shot that the buffalo she felled at the age of twelve was made part of Colorado's exhibit at the Centennial."²⁵ She was considered a skilled mathematician in college, and after graduating, moved to New York, where she studied music, sang in choirs, and obtained a degree in literature. She worked as a customs house inspector and learned French, German, Italian, and Spanish.

Long impressed with Westover's skills, the surveyor of the Port of New York appointed her his private secretary when he became New York's commissioner of street cleaning, making her the first woman appointee in

any city department. Her linguistic ability (Frances Willard wrote that the young woman was "on speaking terms with most of the nationalities coming to our shore") helped her to quell a threatened strike of sanitation workers when she addressed the grievances of the primarily Italian force in their native tongue.²⁶

While Westover worked for the street sanitation department, she observed a street sweeper on a windy day who was forced to sweep up the same pile of dirt five times. She developed an "efficient, labor-saving device that would not only speed the process but make it possible for horses to make the haul up the steep inclines to department dumps without rupturing from the strain of pulling heavy loads."²⁷ The cart was patented in 1892, and was soon a common fixture on the streets of every major city in the world.

Nearly a decade later, Florence Parpart improved on Westover's cart. A newspaper woman, she applied the technology of printing presses to street sweeping.

A single operator could sprinkle, sweep, load, and compress dirt from two miles of street in the same time it normally took twenty-five or thirty men at two dollars a day to sweep by hand. As the horse-drawn wagon moved forward, the driver pressed a foot pedal to spray water and dampen but not saturate the dust; a huge rotating broom attacked the dirt, gathered it, and rolled it up an incline to the wagon, where a powerful screw compressed it. With the entire process carried on inside a protecting apron, said *Patent Record*, no dirt scattered to the sidewalks "to the decided inconvenience of pedestrians."²⁸

Parpart found a backer in Hiram D. Layman, whose name she placed ahead of hers on the patent. With his financial support, "she manufactured and sold the machines and engaged in street contracting businesses in New York; Boston; Chicago; Omaha; Milwaukee; San Francisco; Cambridge, Massachusetts; Camden, New Jersey; Greensburg and Altoona, Pennsylvania; and Portsmouth, Ohio."²⁹

Mushing

In the Arctic regions of North America, the land is frequently covered with bogs, tundra, and permafrost, all of which make road building and summer travel extremely difficult. But come winter, which may last for six to eight months of the year, the ground freezes solid and travel becomes much easier. Before the invention of snow machines, dog sledding (mushing) was the preferred mode of winter travel. Most likely, women have been mushing since there were dogs in the far north. White women who settled in the Arctic quickly learned to run dogs. Nellie Cashman, considered the first woman prospector in Alaska, was also a champion musher. In 1921 at the age of 70, Cashman set a record "as champion musher of the world. She mushed her dog team and sled 750 miles in 17 days, breaking her own trail the entire distance from Koyukuk to Seward."³⁰

A fair number of women grew up in the isolated interior of Alaska during this century, and they learned mushing early. It was an essential survival skill. Several have written about their experiences. Evelyn Berglund Shore was born in 1917. She and her three sisters grew up in a cabin above the Arctic Circle, and helped their mother run the trapline after their father died.³¹ Julie and Miki Collins, born in 1959, also grew up in the isolated interior of Alaska, learning at a young age to mush and run a trapline.³²

The Iditarod, billed as the last great race, was first run in 1973 to commemorate the historic relay of life-saving serum from Seward to Nome in 1925. No women competed the first year, but three entered in 1974. Mary Shields was the first woman to complete the 1200-mile race from Anchorage to Nome, placing twenty-second. She was greeted at the finish line by thirty women and a sign that read, "You've come a long way, baby!"³³

The first woman to win the Iditarod was Libby Riddles in 1985. It was the third time she had entered the race, and was not considered a serious contender by the male contestants. She won the race by leaving a checkpoint during one of the worst storms ever seen during the race, and camping out on the ice while the men remained behind in the relative comfort of the checkpoint. In addition to winning the race, Riddle received the humanitarian award given by the race veterinarians to the musher who took best care of their dogs during the race.³⁴

Susan Butcher has won four Iditarods, making her the second-most winning musher in the history of the race. Her record has been exceeded only by Rick Swenson, who has won five times.

The sport of mushing continues to grow. Women are competing on an equal basis with men and are being taken very seriously in every level of competition, from sprint races to the long distance races such as the Iditarod and the Yukon Quest.

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³ Ivy Pinchbeck, *Women Workers and the Industrial Revolution, 1760 - 1850* (1930; reprint, London: Frank Cass and Co., Ltd., 1977), 2.

⁴ Pinchbeck, 61-2.

⁵ Barbara Mayer Wertheimer, *We Were There: The Story of Working Women in America* (New York: Pantheon Books, 1977), 17.

⁶ Wertheimer, 255.

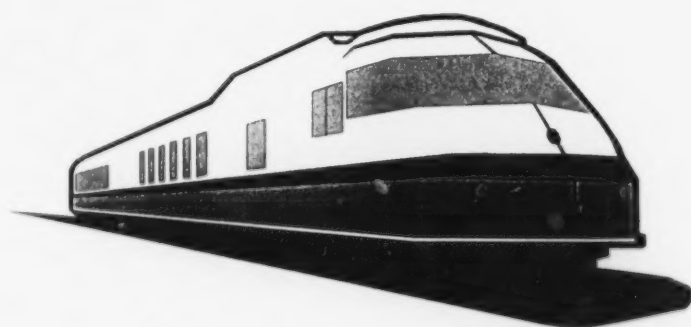
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 - ¹⁹ Luchetti, 46.
 - ²⁰ Silvia Anne Sheafer, *Women of the West* (Reading, MA: Addison-Wesley, 1980), 35.
 - ²¹ Fisher and Holmes, 129.
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 - ²³ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 20.
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 - ²⁵ Macdonald, 210.
 - ²⁶ Macdonald, 207.
 - ²⁷ Macdonald, 207-8.
 - ²⁸ Macdonald, 245.
 - ²⁹ Macdonald, 245.
 - ³⁰ Anne Seagraves, *High-Spirited Women of the West* (Hayden, ID: Wesanne Publications, 1992), 129.
 - ³¹ Evelyn Berglund Shore, *Born on Snowshoes* (1954; reprint, Meadow Vista, CA: Heritage Press, 1993).
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 - ³³ Mary Shields, *Sled Dog Trails* (Fairbanks, AK: Pyrola Publishing, 1984), 45.
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RAIL
TRANSPORTATION



Rail Transportation

The building of the rail system connecting all portions of the country was a significant contribution to the nation's development. While many stories have been written about the men of all races who built the railroads, it is not commonly known that women also played a part. African-American slave women worked on crews alongside male slaves, laying track for the Southern railroads.¹

During the 1880s, the railroads discovered that using pictures of attractive young women helped sell tickets and convince the public that rail travel was safe and practical.² As we shall see, it was a tactic used again with great success by the fledgling automobile and airplane industries.

Women employees were generally scarce in the transportation sector. The 1871 census in Canada reported women workers in only 47 companies, out of the total of 3,760 in the industry. "The largest number of 40 women was reported by the Grand Truck Railway shops at Point St. Charles in Montreal."³ It is interesting to note, however, that railroad worker Harry Gorman, age 40, was discovered to be a woman in 1903. She claimed to know at least ten other women who passed as men working at the New York Central Railway.⁴

During the Mexican Revolution in 1910, women filled many jobs previously held by men, including train dispatchers. It was the first time in Mexican history that women took their place as equals beside men.⁵

A few years later, women in North America and Europe found employment opportunities in the railroads due to the labor shortages created by World War I. Enid Price, writing about women's employment in wartime Canada, stated that

One of the most interesting and radical changes brought about by the war in the world of manual labor was seen in railway shops. The manufacture of munitions was purely a war time industry, and owing to the vital need for adequate production, men and women alike were pressed into service. On the other hand machine shops and railway shops were in existence before the war, and employed only men to do the heavy manual work of constructing and repairing locomotives, machinery and cars. Although in neither machine shops nor iron and steel construction plants were women employed, they were used in railway shops. There were two reasons for this. In the first place enough men were not available to maintain sufficient production. In the second place there was a desire to experiment with female labor and see to what extent it could be used to offset the impoverished labor market, and thus serve the good of all.⁶

Price described the experience of one shop in Montreal, which had employed 4,655 men and only 3 women in 1914, before the start of the war. In October 1916, 210 women were hired for the first time. They were placed in the jobs considered best suited to them, and completed apprenticeships as sweepers and coach washers. Before long some moved

up to higher-skilled work such as brass filing and drilling. "By the end of the first season there were about 50 women working as general carpenters who built refrigerator cars. Their work was entirely satisfactory and some of them earned as much as \$100.00 per month at piece work and by working overtime."⁷ Later women moved into additional positions such as painters, mattress makers, light punch machine and turret lathe operators, bolt and nut threaders, saw filers, armature winders, and buffing and milling machine operators.

According to Price, men and women were paid at the same rate for piece work. Men averaged higher wages per hour, mostly due to their greater experience and skill. The average men's wage in 1916 was 30 cents per hour and women's was 22 cents. However, it is interesting to note that the lowest paid women received 18 cents per hour, while the lowest paid men received 12 cents. Wages had increased considerably by October 1918: men were paid an average of 54 cents and women 45 cents per hour.

Price also noted that a railroad was one of the first Canadian corporations to introduce the use of overalls among women workers. "At first there was a little difficulty in overcoming prejudice, but as the women realized that they not only safeguarded their lives, but their clothes, they quickly adopted them."⁸ Women worked in the railyards in various jobs: there were 32 truckers, 5 checkers, 1 sweeper, 1 brass worker, 53 car cleaners, 6 general cleaners, and 1 supervisor.⁹

After the war most of the women were laid off. Only 39 remained, working as laborers, drillers, painters, and bolt threaders. Price noted that these women "were either widows supporting families or soldiers' wives supporting sick husbands."¹⁰

In rural areas of the United States, farm women were recruited to work on track maintenance during World War I. Other women worked as laborers, washing and cleaning the engines, and loading boxcars. Many worked as low-skilled laborers responsible for "steam-cleaning the engines, wiping off grease and grit so the machinist could inspect for wear and defects on the driving rods and other moving parts. They also dumped ashes from the firebox, coaled and watered the engines."¹¹

A significant number of African-American women found work in the rail industry during World War I. They cleaned cars, repaired tracks, sorted salvage, flagged trains, and worked in the yards. As Jacqueline Jones notes,

These jobs paid higher wages and offered more in the way of personal freedom compared to domestic service. In 1918 one black woman explained the decision made by herself and her friends to take jobs in a railroad yard that paid \$3 a day: "All the colored women like this work and want to keep it. We are making more money at this than any work we can get, and we do not have to work as hard as at housework which requires us to be on duty from six o'clock in the morning until nine or ten at night, with might [sic] little time off and at very poor wages...."¹²

Thousands of women in the United States filled positions as streetcar conductors during the war. When the war ended, three thousand women streetcar conductors lost their jobs to a combination of protectionistic legislation, returning servicemen, the seniority systems, and prejudice.

The unions did not welcome women members, but were forced by the circumstances of wartime to admit them. In Detroit, the Amalgamated Association of Street and Electrical Railway Employees admitted women to be employed as conductors at the late date of 1918. "Just as their probationary period ended, men began returning from overseas and the union refused 250 women regular cards. Only an appeal to the National War Labor Board, which ruled in the women's favor, saved their jobs.¹³" Women members of the same union in New York City were less fortunate.

By the time New York City's male street railway employees came home from the war, companies had already begun laying off women to rehire their former workers. Nevertheless, the Amalgamated Association of Street and Electrical Railway Employees used the rubric of protective legislation to lobby for a state law that would eliminate all women under twenty-one from these jobs and limit the number of hours women could work to a consecutive nine hours per day, to occur between 6:00 A.M. and 10:00 P.M. In a case notorious for pitting male and female union members against each other, the women, all dues-paying union members, complained that the proposed law would prevent them from working the swing shift – a very desirable short stretch of five or six hours in the evening between the day and night shifts. When the men persisted, the women resigned from the union and formed their own organization, sending women from throughout the state to Albany "to show them that they ... were able to take care of their own health and morals." To no avail. The law went into effect in May 1919, and 800 of the 1,500 women lost their jobs. The remaining 700, all ticket agents, as opposed to more highly paid conductors and guards, continued to work at reduced hours until, in 1921, they managed to get statutory exemption from provisions of the law.¹⁴

British women also found rail work during the war that had previously been closed to them, and they started at the men's rate.¹⁵

The Depression initially affected women disproportionately in lay offs. Married women were particularly vulnerable to being laid off, and a strong sentiment across the country was that no family should have two wage earners while other families had none. Some objected to these policies, and some married women who wanted to keep their jobs filed for divorce and lived "in sin." The women at one Texas railroad collectively threw their divorce papers at the board of directors "that wanted to fire them for being married. They were fired anyway."¹⁶

World War II brought women back into the railroad labor force of many countries. In Russia, the percentage of women steam engine operators rose from 6 percent to 33 percent in just one year, between 1941 and 1942.¹⁷ In Japan, tens of thousands of women worked in the national railroad system. They were all dismissed in a single day after the war ended.¹⁸ British railroad women worked as switch tower operators, train crew members, and crossing watchmen.¹⁹

In the United States, women worked in a variety of unskilled and semiskilled positions. Some were general laborers; others were helpers to machinists, mechanics, or

boilermakers. "In the latter part of World War II, many women had been on the job for 2 to 3 years and were experienced enough to be promoted to a supervisory level. This was a significant breakthrough for railroad women, because they had always been supervised by Caucasian men, the most experienced employees."²⁰ The photograph accompanying this information, however, shows a woman supervising an all-woman crew and they are cleaning an engine to prepare it for servicing.

Women also found work as streetcar conductors. Poet Maya Angelou became the first African-American street car conductor in San Francisco, but not without difficulty. She visited the personnel office with "the frequency of a person on salary" and endured endless run-arounds from the white receptionist. Persistence and "a suitably contrived application form" finally wore down the receptionist's resistance.²¹

Inventors

Despite their low employment numbers, women have patented a surprising number of rail-related inventions. In the nineteenth century, women were praised by John Augustine Zahm, writing as H.J. Mozans in *Woman in Science*, for their inventions in a wide range of technical and industrial fields. Among the rail inventions he cited were improvements in locomotive wheels, railroad car heaters, improvements in lubricating railway journals, in conveyors of smoke and cinders for locomotives, and railway car safety apparatus.²²

Matilda Joslyn Gage presented another list of women's rail inventions, including a process for burning petroleum in place of wood and coal for steam generation; an improvement in spark arresters for locomotives; a danger signal for street crossings on railways; a device for heating passenger cars without fire; a lubricating felt for subduing friction; a rapid change box for use at railway stations and ferries; and a method for deadening sound on elevated railways.²³

A representative of the Patent Office selected 125 models of women's inventions to be exhibited at the Woman's Building of the Atlanta Fair in 1895. Among these were five that dealt with railroads, including "Louisa Simpson's apparatus for destroying vegetation on railroads [1878], Augusta Rodgers's for conveying smoke and cinders from locomotives to the roadbed below [1871], and Eleanor McMann's guard for sleeping-car berths."²⁴

Maria E. Beasley obtained fifteen patents in the late nineteenth century, including one for an apparatus to prevent train derailments.²⁵ Maria Girardini secured a patent in 1873 for rails used in street railways,²⁶ and in 1881 Florella L. Kinsman patented a railway car heater.²⁷ Evelyn F. French, with Milton Clifford, received a patent in 1880 for a sound-deadening attachment for railway cars.

Mary E. Walton
Inventor
United States
1881

An urban problem of the late nineteenth century was the noise created by elevated railways that ran through the cities, often right outside the windows of residential buildings. Many prominent male inventors of the time tried – unsuccessfully – to find a way to deaden the din. Mary Walton succeeded. Anne Macdonald describes Walton's process:

Experimenting in her basement, she set up two barrels, stretched a piece of planking across them, used side edges as "stringers" (boards that ran parallel to the track), overlaid short pieces of wood across the planking to act as ties, and then nailed two pieces of railroad iron to the ties. Having simulated a "railroad track," she faced the crux of the problem, how to absorb sound as the wheels passed over the rails at high speed. She described her next steps: "I sawed pieces of board and nailed them in between the ties and underneath the stringers; then I bought at a drug store a bottle of tar, and painted the inside of the box with the tar; then I took a roll of cotton and lined the inside of the box with a thin lining of cotton, and tightly packed it with sand, covering the top with cotton and tar [to keep the sand from flying]."

Importuning a workman who was cleaning her cellar to strike the iron rails with as much force as he could wield while she sped upstairs to her kitchen to audit the noise, she found she could scarcely hear it. She told the manager of the Metropolitan Railroad what she had discovered by comparing her method to a violin: "When you stopped your air passages, you stopped your music, and the stringers acted as sounding boards." Impressed, he agreed to let her test her experiment on his rails, with the proviso that she first obtain a patent and promise to sell him the rights if the test was successful.

When tests proved her right, she received a patent for her method – arranging ties and longitudinal guards to enclose sand or sandlike materials – and sold the rights to the Metropolitan Railroad, leaving her competitors to complain that the company had afforded her a testing opportunity it denied them. Walton smugly told them she did what any persevering inventor/entrepreneur would have done under the circumstances – trounced her rivals!²⁸

Patented in 1881, the method was used by the Metropolitan and other railroads. Matilda Joslyn Gage wrote of Walton's invention, "The benefit to human health and life likely to accrue from this invention can scarcely be realized."²⁹

Olive Dennis
Inventor, Engineer
United States
1920s

As early as 1852 *Scientific American* stated that lack of ventilation made rail travel the most unpleasant means of transportation. If windows were closed, passengers felt stifled; open windows let in cinders and smoke; screens kept out the cinders, but let in smoke and drafts. Various attempts were made at solving the problem, such as Augusta Rodgers' patented method for capping the smokestack to funnel smoke and cinders down to the ground. Nothing seemed to work.³⁰

Olive Dennis was a young woman who graduated from college with a degree in engineering in the 1920s, and went to work as a bridge draftsman for the Baltimore and Ohio Railroad. A year later, she was promoted to the position of Engineer of Service, in reality a kind of consumer advocate melded with an engineering position. The president of the railroad believed that automobiles and buses would soon present greater competition, and he wanted to improve service. In the first year of her new position, Dennis rode over 40,000 miles, mainly in day coaches, checking on customer's complaints.

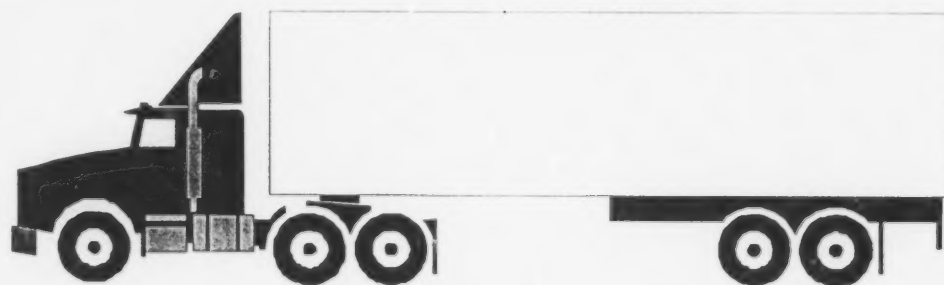
[A]s she checked on rail passengers' complaints that the removable ventilators and screens limited passengers' vision and made it difficult to raise and lower the windows... she decided to build her new small ventilator right into the sash below the window. This meant that each individual passenger could control the air flow, shutting out summer rain when needed, or as her patent stated, introducing "a comfortable breath of fresh air ... in even the coldest weather without drafts on the occupants of the seat behind." ³¹

During her years with the B & O, Dennis did much to improve the quality of rail transportation, enhancing "both the appearance and operation of the railroad, from sleeper services ('Sleep like a kitten on the B&O') to light-lunch counters in coaches, from ventilators to new seat upholstery, from clean lavatories to plane and bus connections at strategic points."³² One writer stated, "When you ride the B&O, observe the excellent passenger service and equipment, the efficiency of operation, the charm of the cars' interiors and furnishings - [it's] all a credit to Olive W. Dennis, a woman 'railroading engineer.'" ³³

During World War II, Dennis became a consultant to the Office of Defense Transportation.

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- ⁹ Price, 33.
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- ¹⁹ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 322.
- ²⁰ Burman.
- ²¹ Jones, 239.
- ²² Macdonald, 257.
- ²³ Matilda Joslyn Gage, "Woman as Inventor," in *Women's Almanac: 12 How-To Handbooks in One*, Kathryn Paulsen and Ryan A. Kuhn, eds. (New York: Armitage House/Information House, 1976), 346.
- ²⁴ Macdonald, 188.
- ²⁵ National Women's History Project poster.
- ²⁶ Macdonald, 387.

- ²⁷ Vare, 111.
- ²⁸ Macdonald, 148, 150.
- ²⁹ Gage, in Paulsen, 346.
- ³⁰ Macdonald, 302.
- ³¹ Macdonald, 305.
- ³² Macdonald, 306.
- ³³ Quoted in Macdonald, 306.



Motor Transportation

The Early Years

In the earliest years of motoring there was no regulation, no licensing and no record keeping, so it is difficult know exactly how many women owned and drove cars. It appears that driving became popular first among women of the upper classes, who (or whose husbands) could afford to buy the expensive machines. "Society columns from the period depict female motorists as a common sight at Newport, Southampton, and Saratoga, but fragmentary evidence from a slightly later time suggests that before 1920, women comprised at most a small minority of drivers."¹ "When New Jersey passed an auto operators' licensing law in 1906, the fact that more than one hundred women applied for such licenses, and that several New Jersey women claimed to have driven thousands of miles, seemed surprising enough to merit a story in the *New York Times*."²

The number of automobiles was small at first and the record keeping of registrations and licensings started slowly, but both quickly mushroomed. In 1900 there were 8,000 passenger automobiles registered in the United States. Only five years later, by 1905, the number of registrations had grown to 77,000. Few states required operator's licenses: only eleven in 1909.

According to Virginia Scharff in *Taking the Wheel: Women and the Coming of the Motor Age*, the sight of women and automobiles raised concerns about women's proper sphere and mirrored other debates about women then current in society.

Whether they took the wheel themselves, or rode as passengers, motoring women asserted not only their intention to conquer distance, but also their right to control a costly piece of property they might not even own outright. Little wonder that observers of the time saw something incongruous, something fundamentally disruptive, in the spectacle of women on wheels. Women in automobiles entered public space at a time of unprecedented debate over women's right and capacity to step into public life with regard to the ballot box and the university. Such an inroad could not escape notice in a context where the distinction between public and private places served as a boundary defining proper masculine and feminine roles.³

Whatever their numbers, as more and more women learned to drive, the broader question of whether women in general could, or should drive motorcars became the subject of patronizing advice, genteel reproof, feminist defense, humorous stories, and heated argument

The case against women drivers has, of course, been a staple of American folklore. Early critics of women drivers, much like their contemporaries who opposed women's entry into higher education and woman suffrage, cited three presumed sources of women's inferiority at the

wheel: emotional instability, physical weakness, and intellectual deficiencies.⁴

Despite these supposed deficiencies, women took the wheel in increasing numbers, and found they liked the independence. By 1921, driving had become sufficiently commonplace for women that the Girl Scouts offered a driving badge. Requirements for the badge included not only proving driving ability, but also knowledge of auto mechanics and first aid.⁵

Racing and Touring Drivers Early 20th Century

Women entered the world of auto racing early on, and competed against men in the first years of auto racing. One of the first racers was Mrs. Clarence Fitler, who won two races at Cape May, New Jersey, in August, 1905. The *New York Times* reported that "Mrs. Fitler was loudly cheered by the thousands of spectators who crowded the boardwalk. She deserved her honors, for she drove with skill and judgment, and won merited approval from the racing sharps."⁶

Joan Newton Cuneo Race Car Driver United States 1905 - 1909

The pre-eminent woman racer of the early years was Joan Newton Cuneo, who also made her racing debut in 1905. From Richmond Hill, Long Island, Cuneo came from a background of wealth and status, as did most other early nonprofessional drivers of the time. She won

numerous track races in the years between 1905 and 1909, and in 1905 had the distinction of being the only woman driver to compete in the first Glidden Cup tour, a one-thousand-mile event that year. She was indeed one of the star attractions on the Glidden tours, held annually as part of a campaign to publicize the motorcar's reliability. In 1907 she completed a fifteen-hundred-mile round-trip trek, limping back to New York with a broken spring and a cracked axle, receiving a silver cup "for her skillful driving and pluck."⁷

In 1909 she raced in New Orleans, "breaking speed records against Ralph De Palma, the most prominent male racing driver of the time."⁸ Her promising career was

nipped in the bud, however, when the American Automobile Association (AAA) decided later that year, for reasons unknown, to ban women drivers and women passengers from races under its sponsorship.

Long distance touring was still an option, however. Automobile manufacturers seized upon the idea of using women to promote their product as safe and reliable transportation, and promoted long distance and cross country tours with women drivers.

Cuneo and a dozen other women drivers participated in a two hundred mile round trip race between New York and Philadelphia in 1909. Since it was a woman-only race, they carried no male passengers.

However, in keeping with the upper-class practice of delegating dirty work to servants (as well as observing the evolving rules of automotive competition that recognized specialized pit crews as a standard feature), they were permitted to have male mechanics accompany them in other cars, "to do such work as cranking the motor ... and generally doing the unpleasant mechanical work."⁹

They set out from New York in sunny weather. After an overnight stay in Philadelphia, they drove back under overcast skies that soon began to pour, soaking the drivers and their no doubt miserable passengers all the way back.

Since the contest was intended to measure the drivers' endurance, skill, and speed, but also to advertise the safety and dependability of motor vehicles, corporate sponsors awarded manufacturers' trophies to five entrants, including Cuneo.... In the end the winners paradoxically not only proved their motoring prowess, but also demonstrated that the sponsors' automotive products were simple and safe enough for even women to drive.¹⁰

Alice Huyler Ramsey
"Woman Motorist of the Century"
United States

In 1909 Alice Huyler Ramsey, who had been one of the winners in the New York to Philadelphia race, became the first woman to drive cross country. At the age of twenty-one and a Vassar graduate, she said she "was born mechanical, an inheritance from my father. My husband wasn't mechanical at all."¹¹ In fact, Ramsey's husband never did learn to drive, but he provided her with a succession of new cars, and supported her driving ventures.

As Virginia Scharff notes, the automobile manufacturers recognized the importance of the cross-country tour in the American psyche, and made it part of their marketing strategy.

For cars to become the nation's dominant form of transportation, over long and short distances, manufacturers had to convince the public that extended auto trips were not only possible, but easy. Automobile enthusiasts regarded the transcontinental automobile trip, first successfully accomplished by male drivers in 1903, as a testament to the motorcar's permanent utility. Finding a way across the North American continent has ever been a theme of American history, symbolizing the interest of the United States and its citizens to take possession of all the land, from coast to coast. Since the middle of the nineteenth century, Americans have undertaken the transcontinental journey, often as not, in families. Yet well into the twentieth century, most people continued to see such journeys as tests of masculine strength and endurance at the wheel. Paradoxically, automotive concerns relied on the expertise and bravery of exceptional women to convince the public that anyone could drive anywhere.¹²

In a publicity stunt that put this message out to the public, the Maxwell-Briscoe company sponsored Alice Huyler Ramsey in the first transcontinental drive completed by a woman. Leaving New York in June 1909 with three women passengers (who did not know how to drive), she headed for San Francisco. The trip, made over roads that were often no more than tracks in the dirt, took 41 days. Maxwell-Briscoe coordinated publicity at every stop along the way, using pilot cars to announce Ramsey's arrival.

For her achievement, Ramsey won a commendation from the Automobile Manufacturer's Association. In 1960, AAA recognized her as "Woman Motorist of the Century," praising not her skill and endurance, but her part in proving that "automobiles are here to stay - rugged and dependable enough to command any man's respect, gentle enough for the daintiest lady." Ramsey, in accepting, included herself among "the greatest women drivers who were convinced we could drive as well as most men."¹³

World War I

Wealthy women motorists found an outlet for their skills and energy providing services during the first World War, both in Europe and the United States. The British were the first to organize women drivers with the establishment of the Women's Convoy Corps and the Territorial and Reserves Force in 1907. The Women's Convoy Corps officially became part of the Voluntary Aid Detachments in 1910, which were designed to assist with medical services in case of invasion. Women who volunteered to serve with these groups were subject to military discipline and training in transport, cooking, laundry, first aid, and nursing. Although considered dilettantes at first, they proved their worth both in Britain and on the continent after war broke out. The Women's Reserve Ambulance Corps was the first emergency service on the scene after London's first major zeppelin attack in 1915. The desperate need for drivers led to the formation of other

organizations such as the Munro Corps and the Scottish Women's Hospital Unit, who served at the front.¹⁴

The British efforts lead to other international organizations of women drivers serving during World War I. Women drivers in France met with opposition when they began driving for the French and British branches of the Red Cross in 1914. The Club Feminin Automobile of Paris offered to provide ambulances and women to drive them, but the French government declined their offer. Finally, the government was forced to accept their services, and issued a call for 250 women ambulance drivers. These women were enrolled in the French Army Sanitation Corps where they conformed to military codes of discipline and training.

American women became involved long before the United States officially entered the war. In 1914, Americans living in London organized a volunteer relief group that became the American Fund for French Wounded (AFFW). By 1916, the AFFW was recruiting drivers – male and female – to deliver supplies to French hospitals. Sometimes referred to as the "heiress corps," the AFFW was lead by prominent and wealthy Americans living in France. The nickname, though condescending, was not without a grain of truth. And the truth was that only wealthy people could fill the requirements of membership: they had to pay their own expenses, provide their own vehicle (including the cost of shipping it to Europe), and drive and maintain their vehicle themselves. But it was not a cushy a job. The living conditions were rough and the work was often physically challenging.

Their duties included acting as translators, transporting supplies to canteens in the dangerous areas near the trenches, and undertaking rehabilitation work in devastated French towns that were sometimes still under fire. AFFW drivers served throughout France, often living in the ruins of the villages they had been sent to aid....

Women who had always had servants found themselves doing menial and arduous tasks when they joined the AFFW. In July, 1917, ten AFFW volunteers set up headquarters at Blerancourt in the Aisne district, using pieces of broken glass to scrape mud off the walls of the ruined chateau that was to house them, cleaning out the stable that was to be their storeroom and garage, and whitewashing the entire operation. In the succeeding weeks, working with the French army, they helped to plow and seed four thousand acres of land, planted three thousand fruit trees, and opened a dairy. Within three months they had also renovated forty-seven houses, and in an effort to restore the local civilian economy had distributed livestock and farm tools to the local residents.¹⁵

The life was hard and certainly different from what they had been accustomed to. Nevertheless, these privileged young women rose to the occasion, and many of them thrived on their new-found skills and freedom from the traditional strictures of upper class women's lives.

Some of the volunteers liked the life so well they continued their service after the war with the American Committee for Devastated France. The Committee established

seven centers for relief work after the war, and in 1921 sent out a call for "any girl who can drive a Ford car" to work in the Aisne.

Volunteers traveling to two hundred villages and hamlets would transport wounded and sick people to hospitals and carry supplies of food, clothing, medicine, tools, seeds, and even livestock. They were required to speak French and to pass driving and mechanical tests, to pay their own expenses, and were expected to maintain their cars and make minor repairs. While their lodgings in town were considerably more comfortable than had been the case during the war, they otherwise faced many of the same difficulties wartime motor workers had encountered.¹⁶

The United States also found uses for wealthy women volunteer drivers. In 1917, the National League for Women's Service and the Red Cross formed the Women's Motor Corps. By the summer of 1918, the Women's Motor Corps was separated from the National League for Women's Service and became a paramilitary organization directly subject to the United States government. The women were trained in tasks ranging from nursing and home economics to signaling, map reading, telegraphy, camping, and motor driving. According to Scharff,

The corps had branches all over the country, with two thousand female volunteers in the New York State Ambulance Corps alone. In New York, the Women's Motor Corps unit had ties to the New York City Police Reserve and the Federal Justice Department's Secret Service. Their duties included meeting hospital trains and troop ships to transport the wounded and sick and taking convalescents for outings. But they also conducted searches of women entering and leaving the Port of New York, and reportedly took on secret espionage projects for the Justice Department.¹⁷

The work was often far removed from the traditional feminine realm, and the entrance requirements for this volunteer civilian corps were tough. Every applicant in the New York branch was required to have a state chauffeur's license, a mechanic's license granted by one of the top three mechanics schools in New York, pass a physical examination administered by a U.S. Army official, be inoculated for typhoid and paratyphoid, and take an oath of allegiance before a federal officer.¹⁸ Once accepted, they trained in ambulance driving, first aid, and handling stretchers, and performed infantry drills. Most drove their own cars, though in 1918, the number of ambulances available to them grew from four to sixteen. The vehicles were serviced by an expert mechanical department of twenty-five women.¹⁹

In addition to the Motor Corps volunteers, other women studied auto mechanics during the war. For those who needed to work for a living, the prospect of a mechanical career was appealing. Automotive schools for women had existed before the war, and their popularity grew during the war years. The national media carried stories about women who served their country as skilled mechanics.²⁰

Women remained interested in mechanics after the war. "When the Knights of Columbus founded a vocational school for women in Washington, D.C. in 1920, hundreds of women took auto mechanics training."²¹ The students were described as former servicewomen and federal workers who hoped to develop skills that would allow them to earn their living in the automotive industry. However, as Scharff points out, "men rapidly reasserted dominance in the expanding auto mechanics profession after the war."²² Women's new technical skills and competence in the field during the war did not result in increased employment opportunities, in part because many of the women who had developed that competence were from monied backgrounds, and did not have to rely on their technical skills for their livelihood.

Women took other war time jobs in the transportation sector. In Britain, women drove tractors, taxis, ambulances, and delivery vans, and worked as auto mechanics. They faced hostility because some of them came from middle and upper class families, and were seen as taking jobs from working class men. The unions tried to derail the government's program to license women as taxi and bus drivers in London, and may have succeeded to some extent, although one source reported that women drove buses outside of London.²³

Manufacturing

In 1910 there were only about 1,000 women, a small fraction of the total work force, in the manufacture of automobiles and automotive equipment. The industry grew at a frantic rate in the following decade, however, and many women entered the industry. In most cases, they worked in departments requiring "traditional" skills, such as sewing upholstery, rather than in the heavy manufacturing end. The percentage of women in the industry grew faster than the rate of the general population, and by 1940, women made up 10.6 percent of the automotive labor force.²⁴

Prior to World War I, the automotive industry was one of the handful in which African-American women were clustered,²⁵ although they tended to be restricted to the lowest skilled and lowest paid positions. During World War II, the Detroit automobile industry "openly refused to hire blacks in general and black women in particular for work in establishments converted to war industry. In late 1942 Detroit area defense plants had only 100 black female production employees out of a total female work force of 96,000; the converted auto industry had hired only 900 black women for nonproduction work."²⁶

As in other defense industries, women workers were discharged at the end of the war. "In June 1946... the number of women employed in production had fallen from a wartime peak of 208,000 to 60,800, and their share of the auto labor force stood only 2 percentage points higher than the figure for 1939."²⁷ The percentage of women members in the United Auto Workers, however, had grown from 7 percent in 1939 to 28 percent in 1944. Many of these women wanted to remain in or return to their jobs. And there were jobs available. In the last half of 1946 the auto industry was beginning its tremendous postwar expansion. As Nancy Gabin reports, the UAW Women's Bureau, created in 1944 to meet the needs of these women members,

sought with some success to sustain the momentum of the war years and the reconversion period despite the postwar consensus on woman's place. By integrating issues of concern to women into the union's agenda and establishing a presence for women in the union leadership and international hierarchy, the bureau counteracted the devastating impact of reconversion and ensured the survival of gender-conscious protest.²⁸

The Bureau tried – without success – to prevent the return to pre-war gender segregation of job titles, but did succeed in protesting discriminatory layoffs and recalls.

Inventors

Just as women were active as drivers from the beginning of the motor age, they also were active in solving some of the problems that accompanied the new forms of transportation.

On a visit to New York City, Mary Anderson of Alabama watched a street car driver repeatedly get out of the car to wipe away the accumulating snow and ice. She invented a mechanical device operated by a lever inside the car that would wipe the snow off the glass. She received a patent for her window-cleaning device in 1903, and offered the rights to a firm in Montreal which turned her down, believing the device had no commercial value. Little did they know that windshield wipers would become standard equipment on American cars by 1916. Lacking much business training herself, Anderson let the matter drop, and thus never made the fortune she might have otherwise.²⁹

Margaret Knight, who invented the machine for making flat-bottomed paper bags and other types of industrial machinery, turned her talents to the automotive industry in her later years. She worked on rotary engines and motors, and received several automotive patents in the first decade of the twentieth century.³⁰

In the 1930s, a *New York Times* article cited women's inventions of internal combustion engines and puncture-proof auto tires as examples of their non-traditional creativity.³¹

More recently, Nancy Perkins, an engineer for the Sears, Roebuck Company, protested the limitation of her work assignments to "women's" products. She was finally assigned to "work on a car battery – in the automotive products division, which was well staked out as a 'masculine' enclave. Her subsequent patent for the 'Incredicell' automotive battery banished any notion that she was out of place!"³²

¹ Virginia Scharff, *Taking the Wheel: Women and the Coming of the Motor Age* (New York: The Free Press, 1991), 25.

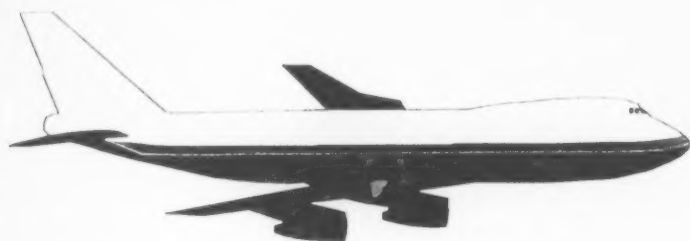
² Scharff, 23.

- ³ Scharff, 22-23.
- ⁴ Scharff, 26.
- ⁵ Scharff, 108-9.
- ⁶ Scharff, 73.
- ⁷ Scharff, 73.
- ⁸ Scharff, 75.
- ⁹ Scharff, 74.
- ¹⁰ Scharff, 74-5.
- ¹¹ Scharff, 76.
- ¹² Scharff, 76.
- ¹³ Scharff, 77.
- ¹⁴ Scharff, 90-91.
- ¹⁵ Scharff, 94-5.
- ¹⁶ Scharff, 105-6.
- ¹⁷ Scharff, 99-100.
- ¹⁸ Scharff, 100.
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- ²⁰ Scharff, 101.
- ²¹ Scharff, 106.
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- ²³ Sheila Rowbotham, *Hidden from History: Rediscovering Women in History from the 17th Century to the Present* (New York: Vintage Books, 1976), 111.
- ²⁴ Janet M. Hooks, *Women's Occupations Through Seven Decades (Women's Bureau Bulletin No. 218)* (Washington, D.C.: U.S. Government Printing Office, 1947), 131-2.
- ²⁵ Gerda Lerner, *Black Women in White America* (New York: Random House, 1972), 258.
- ²⁶ Jacqueline Jones, *Labor of Love, Labor of Sorrow: Black Women, Work, and the Family from Slavery to the Present* (New York: Basic Books, 1985), 239.
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- ²⁸ Gabin, 233.
- ²⁹ Anne L. Macdonald, *Feminine Ingenuity: How Women Inventors Changed America* (New York: Ballantine Books, 1992), 249.
- ³⁰ Macdonald, 254.
- ³¹ Macdonald, 317.
- ³² Macdonald, 364, 366.

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Aviation and Space

Aviation

The field of aviation began to take off in the decade that began with 1910, and women were among the pioneers. In 1910 Blanche Stewart Scott became the first woman to make a solo flight. Ever ready for an adventure, that year she also became one of the first women to drive across the United States. In 1911, Harriet Quimby became the first American woman to qualify for a pilot's license; the following year she was the first woman to fly across the English Channel.¹

Women took up barnstorming, performing remarkable aerial feats for enthusiastic crowds across the country. One barnstormer was Katherine Stinson, who in 1913 became the first woman to fly airmail. "The same year Georgia 'Tiny' Thompson Broadwick became the first woman to parachute from an airplane; her jumps eventually prompted the army's first order for parachutes."²

World War I brought opportunities for employment in aircraft manufacturing to a number of women. In the United States, African-American women entered the northern industrial labor force for the first time; among other things, they manufactured airplane wings.³

A few women flew in military-related activities during World War I.⁴

Women's contributions continued in the 1920s. Bessie Coleman became the first African-American woman to receive a pilot's license, and the first American to receive an international pilot's license from the Federation Aeronautique Internationale. Her dream had been to fly, but she ran into significant obstacles in the United States. Robert S. Abbott, founder of the African-American newspaper *Chicago Defender* and a flight enthusiast, encouraged her to learn French and study aviation in France. She received her license in 1921, and returned to the U.S. the next year, where she started her career as a barnstormer. Her performances were very popular, and she made an early stand for civil rights by refusing to fly at any event until the Jim Crow order was revoked and audiences were desegregated.⁵ Coleman died when her plane crashed before a barnstorming performance in Florida in 1926. She was 34. She never achieved her second dream, that of founding an aviation school for African-Americans, but she is remembered. "Every year African-American pilots honor Bessie Coleman by dropping a wreath on her Chicago gravesite from the air. Bessie is also honored by a mural at Lambert-St. Louis International Airport and on a plaque in the International Forest of Friendship in Atchison, Kansas, the birthplace of Amelia Earhart."⁶

Perhaps the best-known woman aviator, Amelia Earhart took flying lessons from woman pilot Neta Snook in California, and made her first solo flight in 1921. She set a short-lived woman's altitude record of 14,000 feet in her first plane, and spent several years as a barnstormer. She was the first woman to fly across the Atlantic (1928), in a flight in which she was log-keeper, not pilot. She flew the Atlantic solo in 1932, the first woman to do so, and the first woman to cross by air more than once. Other firsts she set: first woman to fly cross-country non-stop (1932), and first woman to fly solo across the

Pacific from Honolulu to Oakland (1935). She disappeared on a flight around the world in 1937. Earhart "used her fame to open opportunities in flying for women, as in helping to found the Ninety-Nines," an organization for women pilots that took its name from the number of the first members.⁷

In her study of women in aviation during the 1920s, Kathleen Brooks-Pazmany summarized their contribution to the growing industry of air transport:

In the 1920s women were a significant force for the progress of aviation. They were among the most daring of the barnstormers, risking their lives routinely in their quest for new and more exciting stunts. Others strove to promote flying as a safe and convenient way to travel. They tested and demonstrated new planes. They carried passengers and gave flying lessons. Women used a variety of means to help aviation develop as a technology, an industry, a business, and a sport. They set new records, constantly testing the limits of the planes and of their own abilities. They raced, both for the joy of the sport and to prove their competence as pilots. They established a category for women's records and founded their own pilots' organization [the 99s], which is still active today.

By their active participation women helped aviation come of age in this country. Their courage and determination as they struggled to meet the challenges of being pilots and to overcome the barriers they faced as women caught the imagination of the country. Their contributions helped to bring aviation into its present place as a vital industry in modern society.⁸

The Beech Aircraft Corporation was founded in 1932 by Olive Ann Beech and her husband Walter. It began as a small commercial enterprise that she guided to become a major defense contractor. "The firm supplied the planes on which 90 percent of all American bombardiers and navigators were trained in World II."⁹ Beech took control of the company after her husband died in 1950, and successfully boosted sales to over \$200 million in 1979.

Elsie Gregory MacGill of Canada also owned a manufacturing plant. She "transformed a railway boxcar plant into an aircraft factory during World War II, producing twenty-three Hawker Hurricane Fighters per week for the Allied effort."¹⁰

During World War II, the Women's Airforce Service Pilots (WASPs) delivered aircraft and towed targets. Many of the pilots were members of the 99s, and they were under the leadership of Jacqueline Cochran. After the war, the Air Force dismissed the WASPs, and refused to recognize them as veterans until 1979.¹¹

After the war Cochran continued to pilot military planes and was involved in the planning of the space program. She became the first woman to break the sound barrier in 1953, and flew double the speed of sound in 1964.¹²

Women continued to set records in aviation. In 1986, Jeana Yeager was one of two pilots on the first nonstop unrefueled flight around the world.

In the world of commercial aviation, women did not get top jobs as pilots until the 1970s. "In 1973 Frontier Airlines hired Emily Howell Warner as a first officer and six

months later American Airlines hired Bonnie Tiburzi, the first woman pilot for a major airline. In 1986 American Airlines by chance assigned the first all-female crew. By 1992 almost a thousand women were flying for major lines."¹³

Space

It's a little known fact that the United States space program actually considered the possibility of women in space from its inception. Jerrie Cobb, a pilot, was the first woman to be selected for astronaut training in 1960. She was one of 13 women who had qualified, out of 25 who applied. In 1962 she testified before a Congressional committee, attributing to sex discrimination the failure of the National Aeronautics and Space Administration (NASA) to use any of these women. It was not until 1978 that NASA named the first six women astronauts: Anna L. Fischer, Shannon W. Lucis, Judith Resnik, Sally K. Ride, Margaret Seddon, and Kathryn D. Sullivan. Sally Ride became the first American woman in space in 1983. By the early 1990s, 15 American women astronauts had flown in space.

The field of aerospace engineering has proven to be somewhat more receptive to women than other engineering fields. Between 1970 and 1990, the percentage of women in the field increased from 1.8 percent to 8.1 percent.

One woman who made significant contributions to the manned space program is Barbara Crawford Johnson. As

manager of systems requirements for the space shuttle program in Rockwell International's Space Division in California, she supervised early trajectories and was in charge of design and performance analysis for the Apollo missions, Skylab, and the Apollo-Soyez test programs.... She has received numerous honors and awards, including the Achievement Award of the Society of Women Engineers [for manned space flight program support], and a medallion presented by NASA in recognition of the role she played in support of the first lunar landing.¹⁴

Inventors

In the early years of aviation, Mary "Carlotta" Myers did research with her husband on lighter-than-air craft. She made her first ascension in 1880. "In the next decade she completed more hydrogen balloon ascents (typically lasting several hours) than any other living person and more than all the other women in the world combined."¹⁵ After a decade of accident-free "skylarking," she retired from performing, but continued her research with her husband for the next 20 years.

Lizzie Heaton, married to inventor George Heaton, made national news in 1905 when he completed a successful test flight of his airship, and attributed the engine design

to her. The Heaton Airship attracted considerable national attention until it crashed after an ascent to 500 feet (George had designed it to go no higher than 250 feet, which he thought was quite high enough for any aircraft). No one was injured in the crash, but the media declared the craft to be a failure, and the Heaton's slipped from sight.¹⁶

In the 1930s, a *New York Times* writer credited women with the development of airplanes and airplane landing brakes.¹⁷ During World War II, Lillian Grenaker "won wartime laurels by solving one of the defense industry's critical problems: how to make a destructible form for molding the rubber fuel tanks needed for navy planes and submarines."¹⁸ The Navy came to her for ideas because her business made products out of paper and cellophane. Despite the fact that engineers working on the problem had already tried and rejected plaster as a solution, Grenaker trusted her intuition. She imbedded a loose coil of rope in wet plaster inside a mold. When the plaster was set, she broke the plaster and used the rope to pull it out. The engineers were nonplussed, and she got the contract to produce the huge rubber fuel tanks.

Researcher Stephanie Kwolek applied her talents to the development of a fiber used for radial tires, airplanes, space vehicles, and bulletproof vests.¹⁹ Engineer Alva T. Matthews' achievements include the development of Telstar tracking antennas and the design of helicopter blades.²⁰

Irmgard Flugge-Lotz
Aviation Engineer
Germany, United States
1903 - 1974

Irmgard Flugge-Lotz was an aeronautic engineer whose research contributed an essential piece of technology necessary for the development of jet aircraft. Her specialty was flight dynamics and navigation. During World War II, she worked on a problem that had plagued aircraft design for over 20 years.

After World War I, the new developments in technology had not, unfortunately, addressed aircraft control. Pilots still had to control all adjustments manually in ailerons during acceleration and in flying curves; even a slight miscalculation caused the new, faster planes to go into a spin and crash.²¹

Flugge-Lotz developed the theory of "discontinuous automatic control", which was also the title of her landmark 1953 book. Discontinuous automatic control "laid the foundation for automatic on-off aircraft control systems, thus making possible the development of jet aircraft."²²

Another major contribution she made to aviation was to establish a method for calculating the lift distribution of wings. Known as the "Lotz method", it represents a major contribution to modern aircraft design.²³

Born in Germany, Irmgard Lotz was interested in engineering even as a girl. She worked her way through college by tutoring other students in fluid dynamics and earned her doctorate in 1929. She married Wilhelm Flugge, also an engineer, in 1938. The two were "protected from the Gestapo by Hermann Goring, Hitler's Luftwaffe commander, who overlooked [their anti-Nazi sentiments] to exploit their technical talents."²⁴

After the war, the couple immigrated to the United States, where Herr Flugge was appointed a professor of engineering at Stanford University. Because of the college's anti-nepotism rules, Flugge-Lotz was hired as only a staff lecturer. In 1960, she was the only woman delegate to an international conference on automatic flight control; shortly afterward, she became Stanford's first woman professor of engineering. "Throughout the 1960s she conducted research in satellite control, heat transfer, and the draft characteristics of supersonic aircraft. In 1970 she was appointed a fellow of the American Institute of Aeronautics and Astronautics – the second woman ever so honored."²⁵

Gertrude Rogallo

Co-inventor of the Rogallo Wing, Hang Gliding
United States
1948

A family project in 1948 led Gertrude and Francis Rogallo to invent a "kite" that became the hang glider and had many applications in space flight. Francis was an aeronautical engineer with a fascination for kites; Gertrude was a highly intelligent and educated woman who had grown up around aviation all her life and was familiar with the field. Francis wanted to develop a flexible kite that would not suffer the fate of so many other kites: broken sticks. The government agency he worked for wasn't interested in the project, so Francis and Gertrude made it a family affair. They even created a wind tunnel in the house by opening the first floor doors and setting a large fan in the kitchen door to test their experiments.

When they perfected the flexible kite, "Gertrude Rogallo recalls that they themselves immediately grasped the aeronautical potential of what they called their 'flexible wing,' realizing its importance for the government space program, then in its infancy."²⁶ Their patent attorney, however, recommended that they focus just on the kite aspect in the patent application.

When the government showed no interest in the design for the space program, the Rogallos started a cottage industry manufacturing Flexikites. Most of the neighborhood became involved in the business. One reporter saw more interesting uses for the "no sticks, no framework, no tail kite... Since radar could detect its aluminized surface and it could carry a radar antennae to broadcast signals, he said, it would be an ideal locator for a downed life raft or plane."²⁷

In 1958, seven years after the original patent, the government finally became interested in applying the flexible wing principle to air and spacecraft, and the Rogallos assigned it all rights – without fee. In the next

decade the Air and Space Administration continued to work with the "Rogallo Wing" (and improvements to it that Francis Rogallo also patented and assigned to the government) and learned it could land a space capsule without parachutes by extending flexible wings from the capsule to slow its re-entry. In 1968 NASA awarded both Rogallos a large cash award for their contributions. Despite the later fame of the invention, including the number of technical papers it spawned, Gertrude Rogallo reminds, "The initial work was done by the two of us at home." The kites were, after all, just proof of a principle, a principle with many more applications than the wing's most common one – sport hang gliding. Advanced models have recovered separated shuttle boosters. They may even be able to recover boosters and engines out of orbit, though, to date, that has not been tried.²⁸

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- ¹ Dorothy Schneider and Carl J. Schneider, *The ABC-CLIO Companion to Women in the Workplace* (Santa Barbara: ABC-CLIO, Inc., 1993), 209.
 - ² Schneider, 209.
 - ³ Jacqueline Jones, *Labor of Love, Labor of Sorrow: Black Women, Work, and the Family from Slavery to the Present* (New York: Basic Books, 1985), 166.
 - ⁴ Schneider, 209.
 - ⁵ Sunny Bristol, "Bessie Coleman (1893-1926): First Licensed Black Woman Aviator in the United States," *Women's History Network News*, January, 1994, 1.
 - ⁶ Bristol, 1.
 - ⁷ Schneider, 77.
 - ⁸ Kathleen L. Brooks-Pazmany, *United States Women in Aviation: 1919-1929* (Washington, DC: Smithsonian Institution Press, 1983), 53.
 - ⁹ Lois Decker O'Neill, *The Women's Book of World Records and Achievements* (Garden City: Anchor Press/Doubleday, 1979), 513.
 - ¹⁰ Ethlie Ann Vare and Greg Ptacek, *Mothers of Invention: From the Bra to the Bomb: Forgotten Women and Their Unforgettable Ideas* (New York: Quill/William Morrow, 1987), 197.
 - ¹¹ Schneider, 209.
 - ¹² Schneider, 55.
 - ¹³ Schneider, 209.
 - ¹⁴ O'Neill, 191.
 - ¹⁵ Macdonald, 159.
 - ¹⁶ Macdonald, 252-4.
 - ¹⁷ Macdonald, 317.
 - ¹⁸ Macdonald, 322.

- 19 Schneider, 134.
- 20 O'Neill, 193.
- 21 Vare, 198.
- 22 Vare, 198.
- 23 O'Neill, 190.
- 24 Vare, 198.
- 25 Vare, 198.
- 26 Macdonald, 330.
- 27 Macdonald, 331.
- 28 Macdonald, 331.



M I L I T A R Y



Military

Ancient

Greek sagas contain numerous references to women warriors, often called Amazons. Writing in the fifth century BCE, the historian Herodotus claimed they came from Asia or Asia Minor. Other writers claimed the Amazons came from the Caucasus. They were supposed to have besieged Athens around 1200 BCE¹, and another report stated that Roman legions were attacked by a horde of hostile barbarians in an unexplored region of the Caucasus in 66 BCE. After a day long battle, the victorious Romans were astonished to discover that their slain opponents were all women.²

For centuries, these reports were believed to be no more than myths. But recent archeological discoveries suggest that there may be truth to the stories. Women's tombs from the Caucasus and east of the Don River show that some women were buried with all the accouterments of warriors: swords, spears, arrows, and in one case, a full set of contemporary armor. Clearly, there were women warriors in the region during the Greek period.³

Other Greek writers such as Diodorus Siculus also described women warriors in Libya⁴, which was the Greek name for Africa. While relatively little is known about these tribes, groups of women warriors have existed in Africa into the historical period.

The Romans also recorded information about women warriors. Women occasionally fought as gladiators in the Coliseum and other arenas over a period of several centuries. A carving dating from the first century shows two armed women in single combat with the inscription, "A dedicatory offering of two women gladiators on the occasion of getting their freedom."⁵

According to the Roman historian Tacitus, the Germanic tribes raised boys and girls in the same manner. He commented that "they are equals in age and strength when they are mated," and that the usual marriage gift given by the groom to the bride consisted of "oxen, a horse and bridle, a shield and spear or sword."⁶ The wife also presented a gift of arms to her husband.⁷ German women hunted alongside their husbands and sometimes accompanied them into battle.

Ammianus Marcellinus, writing in the eight century, "maintained that Germanic wives took an active part in the fighting itself. The Lombard (longbearded) people ... believed that their name derived from a time when their women went into battle with their hair tied under their chins to delude the enemy."⁸

Tacitus and other historians left records of other women warriors who fought against Rome. Boudica of the Iceni led a revolt against the Roman invasion of Britain in the first century. She united the Celtic tribes and initially

enjoyed considerable success in leading the people of her tribe and their allies in an uprising and the subsequent destruction of the newly established colony of retired Roman soldiers at Camulodunum (Colchester). She then proceeded to the Roman capital at London, and the Verulamium (St.

Albans) where an estimated 80,000 of the Roman oppressors and their allies were killed and most of these new towns burnt to the ground. To the patriarchal Romans the worst of this disaster seems to have been that it was led by a woman.... Boudica then exhorted and led the British troops in what was probably the largest and most unified, albeit disastrous, uprising by the British against their Roman conquerors.... The total strength of the British fighting force in Boudica's final battle has been estimated at over 100,000, of whom 80,000 may have perished.⁹

Boudica died after the defeat, and the rebellion ended.

Two centuries later, the Romans fought another woman, Zenobia, who ruled the eastern city of Palmyra. Palmyra was an ancient oasis city in the Syrian desert, strategically placed along the caravan routes. Zenobia became regent on behalf of her son in 267 after the death of her husband, from whom she had learned military strategy. She took control of the army, hoping to "free the East of Roman domination and unite the cities of the Fertile Crescent.... She then proceeded to consolidate and enlarge Palmyra's area of control."¹⁰ By 270, she controlled Syria, Arabia, Mesopotamia, Egypt, and Asia Minor. The new Roman emperor, Aurelian, was forced – reluctantly – to agree to sharing power with her. Zenobia was not content to share, however, and in the next year proclaimed her son emperor and herself Augusta. Aurelian retaliated by declaring war. Events quickly turned against Zenobia, and by the end of the year, Aurelian had reconquered Egypt and laid siege to Palmyra. Zenobia was captured and taken to Rome as a prisoner, where Aurelian allowed her to live in retirement in a Roman villa. Zenobia is remembered for the brilliance of her court and for her military skills. At the height of her career, she controlled nearly all the territory that Alexander the Great conquered.

Africa

Women warriors and warrior chiefs/queens were known in various parts of Africa for centuries. Among ancient rock drawings in the Sahara is a depiction of a battle scene. Upon close scrutiny, archeologists were surprised to discover that the bow-carrying warriors were women.¹¹

In the seventh century, nomadic Jewish tribes lived in the Atlas Mountains of North Africa, along with native Berber tribes. The most powerful of these Jewish tribes was the Kahinah, who dominated much of the area. The leader of the Kahinah, the most powerful chieftain in North Africa, was a woman known as Kahinah Dahiyah Bint Thabitah ibn Tifan.

Hassan ibn al-Nu'man, a Muslim prince from Egypt, decided to win all of North Africa for the Muslims. After destroying Carthage in 687, he was advised that his best strategy would be to destroy the tribe of Kahinah. In response,

Kahinah succeeded in uniting many groups, both Jewish and Christian, in the fight against the Muslim army. She herself led a large force of Berber

and Jewish tribesmen as well as the remnants of the Byzantine army, and gained a victory over the Arabs, who were forced to retreat from the Atlas Mountains. This victory made Kahinah the virtual queen of the whole Maghreb region of North Africa. She ruled over the area for five years – the only time in its history when this area was united under one leader until the time of French rule in the twentieth century."¹²

When the Muslim army attacked again after five years, Kahinah's forces were not as strong. "Fearing defeat, Kahinah took a calculated risk. She ordered all the Berber cities to be destroyed in the hope that the Arabs would not want to bother fighting for a wasteland. She lost the gamble when the Arabs persisted in their siege."¹³ Just before dying in battle, she ordered her sons to surrender. They eventually converted to Islam and were offered places in the Arab armies. Scattered groups of Jews survived in the Atlas Mountains for centuries until they were resettled in Israel in 1948.

Another Jewish woman emerged as a military leader in the tenth century. Known as Judith the Fire, she fought and vanquished the Christians in Ethiopia, dethroning the Solomonic line of kings. She placed the first of eleven Zague kings, who continued to rule for 354 years until a descendant of the Solomonic line reclaimed the throne. According to Jeanne Noble, "in addition to driving out the long established Christian monarchy, she burned all the churches and the capital of Axum. She was a wild fighter according to the scant legend about her, and was motivated by the desire to establish Judaism as a religion, which indeed she did for over 300 years."¹⁴

African women fought the forces of colonialism in the seventeenth and eighteenth centuries. Zinga (also known as Ginga or Nzingh) was born in Angola in 1582, and was a sister of the king.

During her brother's reign she helped negotiate a treaty with Portugal, but when she rose to the throne she rejected it. Instead, she allied her army with the Dutch to fight the invaders.

Although defeated, she was not vanquished. She retreated to the jungle and held the Portuguese at bay during an eighteen-year guerrilla war. On her death at eighty-one, Angola finally fell into colonial hands.¹⁵

Zinga "is noted for her bravery, intelligence, and resolute efforts to keep the Portuguese at bay in the early stages of colonialism."¹⁶

Chaka was a Zulu Chieftain in Central Africa during the colonial period. She united many tribes of Central and South Africa into the Bantu nation, which at its zenith occupied two-thirds of sub-Sahara Africa. "Chaka united the entire Zulu nation against the Dutch and English with a military genius unique in history."¹⁷

Women warriors existed in many other African tribes as well.

The Lango, a Nilotic tribe, recount tales about the feats of arms performed by women; and long before we heard of the exploits of the "Amazons" of the kings of Dahomey, Gezo, Glegle and Behanzin, there were written

accounts celebrating the courage of the female legions who fought in the armies of Monomotapa and reporting the privileges they enjoyed.¹⁸

According to Noble, the Amazons existed long before the European colonial period. The most famous were the Amazons of Dahomey, in what is now the country of Benin.

The Amazons guarded the king's palace and took part in many battles. They wore uniforms, were well armed, seasoned warriors, and famous for their discipline and courage. The Amazon guard was said to have consisted originally of 5,000 girls and to have been first formed in 1729.¹⁹

The women of this legion were celibate, but were allowed to marry after they retired. They played an important role in the politics of the region up to the end of the nineteenth century, and were regarded as more capable in battle than men.

Asia

Throughout Asia there are records and legends of women warriors. In 35 CE, two sisters known as Cheng Tse and Cheng Erh led an uprising in Tonking against Chinese imperialism. Unfortunately, their undisciplined army was overwhelmed and the two sisters were executed.²⁰

Other Chinese women fared better. In the seventeenth century, Shen Yun-Yin took her father's place in battle after he was killed. "As the commander, she led the army to victory and brought her father's body back for burial."²¹ In the same century, Ch'in Liang-yu was given command of the army after her husband's death.²²

During the peasant revolt in 1851-64, known as the Taiping Revolution, a woman named Hong Xuanjiao led an all-female combat division. "By the time the Taiping armies took Nanking there were forty women's armies, totaling some hundred thousand women."²³

There appear to have been two women named Chand Bibi of Bijapur, Hindustan, in India, who are remembered for their military prowess. The first was reportedly so enamored of the dashing figure she cut on the battlefield that she deliberately picked fights with neighboring rajahs. She was fatally ambushed in 501.²⁴ The second Chand Bibi lived a thousand years later. When her city was besieged by a Mongol invasion in 1595, the city commander was ready to surrender. Chand Bibi refused to accept his advice, however, and covering her face with the required veil, she personally led the battle, successfully defending her city and lifting the siege.²⁵

Another Indian woman, Lakshmi Bai, the Rani of Jhansi, "studied martial arts and, armed with a sword and pistols, led men of the Bengal army in a revolt against British rule shortly before the American Civil War. She met a soldier's end, dying in hand-to-hand combat."²⁶

Sheger-Ud-Durr, a harem slave who rose to the position of the favorite wife of the Turkish sultan, took control after Christian crusaders led by Louis IX of France killed her husband in 1250. She assumed the regency, reorganized her army, and defeated the invaders. The French survivors were taken as prisoners and later ransomed off.²⁷

Europe

Women took on roles of military leadership in the Middle Ages. One was Aethelflaed, the daughter of King Alfred, who

led warriors against the Vikings, built fortresses along the Mercian frontier, and repaired Roman walls. Some of her fortresses, like Warwick and Stafford, became centers of local trade and government. By the time of her death in 918, she had conquered eastern England as far north as the Welland River (north of Norfolk), helping her brother Edward the Elder become the most powerful ruler in England.²⁸

Historian Sheila C. Dietrich noted that "Aethelflaed's political control of Mercia and her military leadership of its army were instrumental in reconquering areas taken by the Danes and in paving the way for the unification of England."²⁹

In the mid-eleventh century, Matilda, countess of Tuscany, "heiress to a vast holding that extended from the northern slopes of the Apennines to the foothills of the Alps,"³⁰ was a "warrior for Pope Gregory VII, and served in several military engagements in the cause of Alexander II, leading soldiers on horseback and wielding a sword."³¹ A contemporary of Matilda's was Sichelgaita, a Lombard princess who married a Norman soldier. She often accompanied her husband into battle. On one occasion, when Norman soldiers were put to flight by the Byzantines at the battle of Durazzo, she called after them to stand and fight. When they continued to retreat, she "grasped a long spear and at full gallop rushed after the fugitives, and on seeing this they recovered themselves and returned to the fight."³² The fact that, as reported by one historian, "when dressed in full armor the woman was a fearsome sight,"³³ no doubt helped change the soldiers' minds.

Queen Eleanor of Aquitaine "led a force of women dressed as men, mounted on horses and armed with weapons, during the Second Crusade,"³⁴ in the twelfth century. Two hundred years later, English woman Margaret Paston commanded the defense of a manor house against siege.³⁵

Prior to the twentieth century, physical examinations were not required of army or navy recruits, and untold numbers of women took advantage of this fact. Some wanted a life of adventure; others wanted to escape the confines of a traditional female role; others were looking for missing husbands or lovers. Whatever the reason, some women donned men's clothes and went to war. One such woman was Nadezhda Durova, who changed her name to Alexander Vasilevich and joined the hussars in Russia in the early nineteenth century. "For ten years she passed as a man and was awarded the Cross of St. George for her exceptional bravery."³⁶ When rumors finally caught up with her, she had to explain

herself to Tsar Alexander. Apparently she didn't exactly confess, but did beg not to be sent home. The Tsar, considering her record of bravery, transferred her to the Mariupol Hussars, which was among the best regiments in Russia. After retiring, she published an autobiography, *The Calvary Maiden*.

Numerous Russian women fought – as women – in the first and second World Wars. In 1916, the Russian Imperial Army equipped regiments of volunteer women soldiers for fighting on the front. These regiments proved so effective under fire that they became known as the "Battalions of Death."³⁷ In World War II, regularly enlisted regiments of women fought on the front lines against the Germans.³⁸ One historian noted that women fought "most often in guerrilla units but also as machine gunners and snipers; no unit lacked women altogether. Women joined the medical and signal corps and several air regiments consisted entirely of women. The unit that captured Hitler's chancellery had a woman major."³⁹

United States

European women colonists participated in the defense of their communities. In 1745, Christine Zeller found herself alone in the fort she had designed and supervised in construction when Indians attacked. She killed three with an ax as they climbed through a window. The others fled.⁴⁰

While Paul Revere was made famous for his ride to alert the militia, sixteen-year-old Sybil Ludington didn't get as much attention. She rode 30 miles that night to call out the militia against a British invasion in 1777.

Elizabeth Zane was another woman who defended her settlement. During an Indian attack on the West Virginian fort in 1782, she realized the gunpowder was about to give out. Despite attempts to stop her, she ran from the fort to an isolated cabin where she recalled some powder had been stored. Despite being the target of Indian arrows and bullets, she managed to return safely with the keg of powder. As a result of her action, the settlers were able to hold out until help arrived several days later.⁴¹

English-born Ann Bailey became a woodswoman and military scout after her husband died in 1774. On one occasion in 1791, "she relieved Fort Lee when it was closely beset by Indians and ammunition was running low, by riding alone 100 miles for powder."⁴²

During the Revolutionary War, it was common for women and families to travel with the army regiments.

Colonial women could load and fire muskets, nurse the wounded, make camp, and cook under the most primitive conditions. Army camp followers – quite different from what the term might imply today – followed their husbands on long marches and sometimes into battle. They worked on regular army assignments and received half rations for themselves and quarter rations for their children, who often accompanied them. Many were refugees from towns that had been burned out or areas captured by

the British; army rations meant the difference between eating – little as the food allotment might be – and starving.

Women cooked for the troops and nursed the wounded and sick. They mended and sewed and laundered. On the marches they carried their share of supplies and ammunition on their backs. All classes of women followed the Continental Army from Martha Washington and other officers' wives to the wives of the newest green recruits. Women who could write performed clerical and copying tasks. Others carried water to soldiers in battle, passed bullets to the front lines, and loaded and fired the cannon themselves when necessary. At night they crept over the battlefield, scavenging the dead bodies, stripping them of their clothes to help keep the ragged Revolutionary soldiers warm.⁴³

The first woman known to have fought in the Revolutionary War was Margaret Corbin. She replaced a wounded gunner – who may have been her husband; accounts vary – and fought in his place. Though seriously wounded, she defended her position until overrun. Her injuries left her with a useless arm. She was cited by the Continental Congress for her bravery, received the first government military pension awarded to a woman in the United States, and a "compleat suit of cloaths" each year for the rest of her life. When she died in 1800, she was buried at West Point.

Another famous camp follower was Mary Ludwig Hays, also known as Molly Pitcher, for her job of bringing water to the soldiers in battle. When her husband was wounded, she took his place "and is said to have fired the last shot before Fort Clinton fell."⁴⁴ She was honored by George Washington for her bravery and also received a pension from congress.

As mentioned above, some women donned men's clothes to enlist in the military. The best known woman to enlist in the Continental Army was Deborah Sampson. She joined in 1782 under the name of Robert Shurtleff, fought in several battles and was wounded. Her true sex was discovered while she was in the hospital recovering, and she received an honorable discharge. She had served one and a half years.⁴⁵ Her church excommunicated her for living as a man. Later she published an account of her adventures, and toured New England as a lecturer, becoming the first woman in the United States to earn money as a public speaker. She received a small government pension until her death in 1816.⁴⁶

It is impossible to know how many women enlisted in military service under male identities. They are recorded for history only if their secret was found out. Nonetheless, the numbers of known women can be surprising. Richard Hall, in *Patriots in Disguise: Women Warriors of the Civil War*, found records of over 70 women who served in the Union and Confederate Armies during the Civil War. He comments that

Countless stories about female soldiers are recorded as anecdotes in soldiers' memoirs, diaries, letters, and newspaper reports. Most often they are passing comments about "oddities" observed in camp or on the battlefield, and basic information (like names or regiments or hometowns) that would enable more complete identification are totally lacking. Still,

brief as some of the stories may be, they indicate the presence in both Union and Confederate armies of women who were there to "soldier" – for whatever personal reason – and not merely camp followers or other shallow opportunists.... [Most] women who tried to enlist in male disguise were not sufficiently "masculine" to get away with it for long. Probably there were more female soldiers early in the war, who were gradually weeded out or discovered or left the army when their husbands or boyfriends were killed or wounded.

Still, in 1864 and 1865 we find "survivors": women who had managed to remain undiscovered until more extreme events (pregnancy, serious wounds, or death in battle) disclosed their secret. We also find many of them to be sergeants or even officers, suggesting that they had above average soldiering skills and leadership ability. They had competed successfully on equal terms in the male-dominated business of combat warfare.⁴⁷

Jennie Rodgers, who was born in Ireland and stowed away on a ship to come to the United States in 1844, enlisted in the Illinois Volunteer Infantry under the name of Albert D. J. Cashier. She fought in a total of 40 battles and skirmishes, and "holds the record for *documented* length of service by a female soldier in the Civil War."⁴⁸ Considered very dependable and apparently fearless, Cashier was often selected for foraging and skirmishing duty. "In one skirmish, Cashier was captured by Confederate soldiers, but seized a gun from the guard, knocked him down, and fled back to Union lines."⁴⁹ She was never injured in battle, and received a hero's welcome when she returned home after the war. Rodgers continued to live as a man for the rest of her life. Her true gender was discovered only when she was sixty-six and had broken a leg. The physician agreed to keep her secret, and helped her get admitted to the Soldiers' and Sailors' Home in Quincy, Illinois, where she spent the rest of her days reminiscing with other veterans.

Loreta Janeta Velasquez enlisted in the Confederate Army under the name Harry T. Buford. Her original purpose had been to stay with her husband, but she continued in the army after his death. Born in Cuba, raised in New Orleans, she claimed her inspiration was Joan of Arc. She fought in several battles, including Bull Run, and several times commanded a unit. Later she worked as a spy for the South.

Sarah Emma Edmonds (later, Seelye) served two years as Franklin Thompson in the Union Army. As a child, she had strongly felt the oppressed position of women in society. After reading a novel entitled *Fanny Campbell, the Female Sailor*, she resolved that she would escape the woman's lot by assuming a male identity. While in the army, she served as a soldier, mail carrier, and spy. She later published an account of her life, *Nurse and Spy in the Union Army*. She assumed female attire, attended Oberlin College, and eventually married.

Women served on both sides of the conflict in other capacities. Harriet Tubman served three years of outstanding military service as a spy, scout and guerrilla leader. "Among her various scouting exploits, the most spectacular was the engagement on the Combahee River, in which she piloted Colonel James Montgomery and his black troops up

the river, lifting torpedoes and rescuing 756 slaves without the loss of a single Union soldier."⁵⁰

"Wild Rose" O'Neale (Greenow) was a successful Confederate spy who operated in Washington, D.C. She

controlled a five-state network of over 50 spies, 48 of whom were women and young girls, and was in touch with a host of blockade runners as well as important senators and government officials on the Union side. It is said that Union army officers would seek her help in getting promotions! Even in jail she continued to operate her network. She died a dramatic death at sea one stormy night in 1864 when her small boat capsized during an attempt to run the Union blockade.⁵¹

Anna E. Carroll, the daughter of a former Maryland governor, took an early interest in politics and public affairs, and became an influential writer on political issues. Acting on her warning that secessionists could gain control, the governor of Maryland canceled the state legislative session in the spring of 1861. Her treatise defending Abraham Lincoln's suspension of habeas corpus in Maryland was so persuasive that President Lincoln had copies distributed to government officials. Some of her other writings are credited with influencing constitutional thought.

Carroll visited St. Louis in the fall of 1861, "looking into the feasibility of a Union attack down the Mississippi River. She inspected military installations, studied maps, interviewed officers, and became convinced the proposed head-on campaign against the South's best defenses was too risky."⁵² Instead, she proposed an attack along the Tennessee River, a plan which proved to be successful and paved the way for Sherman's march to the sea. When she claimed authorship of the strategy, others contended that her report had been timely, but military officials had already been discussing the Tennessee River plan.⁵³ Carroll received payment for her report, but it was far less than she believed was her due.

Dr. Mary Edwards Walker served as a surgeon in the Union Army. She was a prisoner of war in 1864, until she was exchanged for a Confederate prisoner. In 1865, she became the first woman to receive the Medal of Honor.

Native American

Although war was not the usual pursuit of Native American women, a number of women in various tribes distinguished themselves in this area, becoming respected warriors and chiefs. According to Caroline Niethammer,

War occupied much of the time and energy of the early Native Americans. Wars were fought to protect territory, food supply, and ultimately the continuance of the tribe; wars were fought for revenge against previous

injuries; wars were fought as a means of gaining prestige by the valiant warriors; and wars were fought for the sheer hell of it.

Although fighting battles with the enemy was usually the duty of the men, women could not help but be involved in martial activities. Most Indian women limited their participation to helping outfit their brothers and husbands for their expeditions, but other, stronger willed and more individualistic women became warriors in their own right.⁵⁴

One was Lozen, a Warm Springs Apache woman who became the subject of legend. She was the sister of Victorio, a famous chief. As a girl she became highly skilled at riding and roping, and was better than any men of her tribe at stealing enemy horses. According to the legend, she developed a sixth sense about the location of the enemy, and was frequently invited to join the warriors at the council fires as they planned war strategies.⁵⁵

Ehyophsta (Yellow Haired Woman) of the Cheyenne distinguished herself in an important battle between the Cheyenne and the Shoshonis in 1869. She killed two Shoshoni warriors, and earned a place in the small society of Cheyenne women who had been to war with their husbands.⁵⁶

Chief Earth Woman was an Ojibwa woman who joined a war party and was able to predict the movement of enemy warriors. She scalped one warrior in battle, and was honored along with the men of her group. According to Carolyn Niethammer, she "fought for the glory of war [and was] one of the few Native American women to seek the enemy on the warpath like a man."⁵⁷

The Crow "Woman Chief" was the most famous female war leader among the tribes of the Upper Missouri. Edwin T. Denig, a trader who had met her on several occasions, wrote the following biography of this remarkable woman in 1855-56.

Perhaps the only instance known of a woman attaining the rank of chief among any of the tribes whose histories we attempt has happened among the Crows. It has ever been the custom with these wandering people to regard females in an inferior light in every way. They have no voice in council, or anything to say at assemblies formed by men for camp regulations. Even the privilege of intimate conversation with their husbands is denied them when men are present. They have their own sphere of action in their domestic department, from which they are never allowed to depart, being considered by their husbands more as a part of their property than as companions.

This being the case, they seldom accompany parties to war. Those who do are of the lowest possible description of character, belong to the public generally, have no home or protection. Sometimes females of this stamp are taken along to make and mend shoes, dry meat, cook, etc., but they are never allowed to take part in battle. Even if they were, their inexperience in the use of weapons would soon cause their death. For such as these there is no opportunity to distinguish themselves. They must be

content with the station of servant and that of the very lowest kind of drudgery.

The case we are about to relate is that of a Gros Ventre of the Prairie woman taken prisoner by the Crows when about 10 years of age. From a personal acquaintance of 12 years with this woman we can lay her true history before the reader.

Shortly after her capture the warrior to whom she belonged perceived a disposition in her to assume masculine habits and employments. As in the case of the Berdache who, being male inclined to female pursuits, so this child, reversing the position, desired to acquire manly accomplishments. Partly to humor her, and partly for his own convenience, her foster father encouraged the inclinations. She was in time placed to guard horses, furnished with bow and arrows, employing her idle time in shooting at the birds around and learning to ride fearlessly. When further advanced in years she carried a gun, learned to shoot, and when yet a young woman was equal if not superior to any of the men in hunting both on horseback and on foot.

During her whole life no change took place in her dress, being clad like the rest of the females with the exception of hunting arms and accouterments. It also happened that she was taller and stronger than most women – her pursuits no doubt tending to develop strength of nerve and muscle. Long before she had ventured on the warpath she could rival any of the young men in all their amusements and occupations, was a capitol shot with the rifle, and would spent most of her time in killing deer and bighorn, which she butchered and carried home on her back when hunting on foot. At other times she joined in the surround on horse, could kill four or five buffalo at a race, cut up the animals without assistance, and bring the meat and hides home.

Although tolerably good looking she did not, it seems, strike the fancy of the young men, and her protector having been killed in battle, she assumed the charge of his lodge and family, performing the double duty of father and mother to his children.

In the course of time it happened that the Blackfeet made a charge on a few lodges of Crows encamped near the trading fort in their country – our heroine being with the lodges.... Several men were killed and the rest took refuge within the fort.... The [Blackfeet] made a stand beyond the reach of guns and by signs exhibited a desire to speak to someone in the fort. Neither Whites nor Crows could be found to venture out. But this woman, understanding their language, saddled her horse and set forth to meet them. Everyone sought to detain her, but she would not be persuaded. The fort gates were opened and she went on her dangerous errand.... Several Blackfeet came to meet her, rejoicing in the occasion of securing an easy prize. When within pistol shot, she called on them to stop, but they paid no attention to her words. One of the enemies then fired at her and the rest charged. She immediately shot down one with her

gun, and shot arrows into two more without receiving a wound. The remaining two then rode back to the main body, who came at full speed to murder the woman. They fired showers of balls and pursued her as near to the fort as they could with safety approach. But she escaped unharmed and entered the gates amid the shouts and praises of the Whites and her own people.

This daring act stamped her character as a brave. It was sung by the rest of the camp, and in time was made known to the whole nation. About a year after, she collected a number of young men and headed her first war excursion against the Blackfeet. Fortune again favored her. She approached their camp in the night, stole 70 horses and drove them with great speed toward her home. But the enemies followed, overtook them, and a sharp skirmish ensued, which resulted in the Crows getting off with most of the animals and two Blackfeet scalps. One of the two Blackfeet the woman chieftain killed and scalped with her own hand. The other, although shot down by one of her followers, she was the first to strike and take from him his gun while he was yet alive 'tho severely wounded. It may reasonable be supposed that coups such as these aided to raise her fame as a warrior, and according to their own usages, from the fact of striking first the bodies of two enemies, she could no more be prevented from having a voice in their deliberations. Other expeditions of a still more hazardous nature were undertaken and successfully carried through by this singular and resolute woman. In every battle around their own camp or those of their enemies some gallant act distinguished her. Old men began to believe she bore a charmed life which, with her daring feats, elevated her to a point of honor and respect not often reached by male warriors, certainly never before conferred upon a female of the Crow Nation. The Indians seemed to be proud of her, sung forth her praise in songs composed by them after each of her brave deeds. When council was held and all the chiefs and warriors assembled, she took her place among the former, ranking third person in the band of 160 lodges. On stated occasions, when the ceremony of striking a post and publicly repeating daring acts was performed, she took precedence of many a brave man whose career had not been so fortunate.

In the meantime she continued her masculine course of life, hunting and war. Heretofore her attention had been but little attracted to personal gain in the way of barter. Whatever hides she brought home from the hunt were given to her friends, 'tho the meat was cured and dried by herself and the children under her charge. When horses were wanting she drew upon her enemies for a supply and had been heretofore uniformly successful. She had numbers of animals in her possession, with which she could at any time command other necessities.

But with the Indians it is the same as with civilized persons. The richer they become the more desirous they are to acquiring more. As yet no offer of marriage had been made her by anyone. Her habits did not suit

their taste. Perhaps they thought she would be rather difficult to manage as a wife. Whatever the reason was, they certainly rather feared than loved her as a conjugal companion, and she continued to lead a single life. With the view of turning her hides to some account by dressing them and fitting them for trading purposes, she took to *herself a wife*. Ranking as a warrior and hunter, she could not be brought to think of female work. It was derogatory to her standing, unsuited to her taste. She therefore went through the usual formula of Indian marriage to obtain an authority over the woman thus bought. Strange this country this is, where males assume the dress and perform the duties of females, while women turn men and mate with their own sex!

Finding that employing hands advanced her affairs in the lodge, in a few years her establishment was further increased by taking three more wives. This plurality of women added also to her standing and dignity as a chief, for after success at war, riches either in horses or women mark the distinction of rank with all the Prairie tribes. Nothing more was now in her power to gain. She had fame, standing, honor, riches, and as much influence over the band as anyone except two or three leading chiefs. To either of their offices she could in no wise expect to succeed; for to be a leader required having strong family connection, extensive kindredship, and a popularity of a different description from that allotted to partisans. This being the case she wisely concluded to maintain her present great name instead of interfering with the claims of others to public notice. For 20 years she conducted herself well in all things appertaining to war and a hunter's life.

In the summer of 1854 she determined to visit in a friendly way the Gros Ventres of the Prairie.... [In 1851 the Gros Ventres and Blackfeet had] evinced a willingness to abstain from war excursions, and sent friendly messages to the Crows and Assiniboines containing invitations to visit them. The Assiniboines did so, were well received, hospitably entertained by the Gros Ventres, and dismissed with horses as presents.... With the view of ascertaining how far their hostile spirit had been quelled, and perhaps of gaining a goodly number of horses, this Woman Chief undertook a visit there, presuming that, as she was in fact one of their nation, could speak their language, and a general peace was desired, she could associate with them without being harmed. Many old and experienced fur traders endeavored to dissuade her from this journey, as her feats against the [the Gros Ventres] were too notorious to be easily overlooked. But contrary to the advice of her friends she proceeded.

When near the camp, however, she encountered a large party of the Gros Ventres of the Prairie who had been to Fort Union and were returning home. These she boldly met, spoke to, and smoked with. But on their discovering who she was, they took the advantage while traveling with her to their camp to shoot her down together with the four Crows who had so far borne her company.

This closed the earthly career of this singular woman and effectually placed a bar to any hopes of peace between the Crows and her murderers. Neither has there since appeared another of her sex who preferred the warrior's life to that of domestic duties.⁵⁸

Mexico

In 1910 Mexican women supported the Revolution, just as women have done in nearly every war before and after, by taking on responsibilities that had been hitherto delegated only to men. The *New York Times* reported in 1911 that "women have taken a spectacular part in the revolution." Women "were in charge of medicine, munitions, clothing, food, mail, and information concerning the enemy on the front lines. They also worked as secretaries, train dispatchers, telegraph operators, pharmacists, reporters, nurses, teachers, and businesswomen."⁵⁹

Some women became spies. Aurelia Rodríguez was captured while on a spy mission and imprisoned. While she was in prison, her newborn baby died because she could not nurse it.

Other women, such as Margarita Neri, assumed military posts and had hundreds of men under their command. One observer noted that

cases in which women occupy command positions are not rare, like the one of Carmen Alanís, who rises to arms in Casas Grandes, Chihuahua, and participates in the capture of Ciudad Juárez with 300 men under her command; Ramona Flores who occupied the position of chief-of-staff under a caracista general operating out of the northeast. She had armed a contingent with the inheritance left by her husband, who died in the *maderista* rebellion.⁶⁰

Some rose to become officers, such as Juana Gutiérrez de Mendose and Dolores Jiménez y Muro, who became colonels. Gutiérrez de Mendose "confronted Zapata directly in order to impede abuses of the troops."⁶¹ The Narváez sisters "coordinated an operation that manufactured and distributed arms to revolutionary forces through intricate channels for contraband."⁶²

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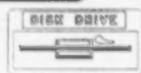
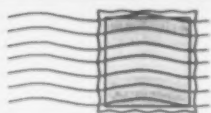
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 - ⁴ Heinrich Loth, *Women in Ancient Africa* (Westport, CT: Lawrence Hill & Co., 1987), 61.
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Miscellaneous Professions

Barber, Hairdresser

The professions of barber and hairdresser have had an interesting history of gender patterns. Both men and women have practiced these trades, sometimes equally, sometimes with one gender or the other dominating.

In the Middle Ages, the professions of barber and surgeon were closely allied. Barbers not only cut hair and shaved beards, they commonly treated minor ailments and injuries, and sometimes performed minor surgery. Frequently a husband and wife practiced the trade jointly. For example, Anne Casset and her husband Benoit Fanilhon were granted "letters of mastership in barbering" from King François I in 1537. They may have gone over the heads of the guild masters in obtaining these letters, which limited their practice to "the simple tasks of barbering – shaving, bleeding, and similar jobs – rather than for surgery, which Fanilhon was to add himself later on."¹

As in other organized trades of the period, daughters and widows often carried on the trade of their fathers and husbands. Some widows may have rented out their husband's shop to journeymen barbers rather than practice the trade themselves, but others actively worked in the trade. Dame Marguerite Roybet "was actually called a *barbière*... after the death of her husband, a master barber-surgeon" in 1550.² About that time, disputes also arose in the barber-surgeons' guild about the practice of widows, who were eventually limited to shaving beards and treating simple wounds, and were prohibited from renting out their shops to journeymen.³

Women worked as barbers, with their husbands and on their own, serving both men and women until the mid-eighteenth century in Europe and the North American colonies.⁴ They also continued to perform minor surgery such as pulling teeth or opening veins for bleeding.⁵

Hairdressing was considered a woman's trade until the late-eighteenth century. In some cases, husband and wife still worked as partners, but there are many records of women in business by themselves. This began to shift in the early 1760s, when French fashions adopted in England required that women of standing hire male French hairdressers. Women hairdressers began to find it increasingly difficult to find work.⁶ Ivy Pinchbeck noted

How completely the trade was lost to women by the end of the [eighteenth] century is shown by comments on "male hairdressers" in 1804 by the Ladies' Committee, and their suggestion that "a well educated Englishwoman should be accepted as an attendant at the toilet," in preference to *men*, unknown, unaccredited, and not otherwise recommended than by having been imported from the shores of France or Italy.⁷

In less than a century, the pendulum of the trade began to swing back again:

In 1859 Jessie Boucherette had established the Society for Promoting the Employment of Women, and attempted to introduce women into the exclusively male occupations such as ladies' hair dressing. The employers thought that the men would not stand for it and refused to apprentice girls to the trade, but a chink in the defenses appeared in 1868 when the men went on strike, and a Mr. Douglas of Bond Street took the opportunity of teaching a dozen women "the great art and mystery of hair-cutting."⁸

By the late 1800s, the trade had lost most of its medical functions, due in part to the growing strength of the medical profession. Barbering and hairdressing also split into male and female occupations. That split was at least partially reversed during World War II, when women filled many jobs, including barbering, that were considered "men's jobs."⁹ In the 1960s and '70s, women began to entering the barbering trade once more. Today, a woman barber is not a novelty and many hair shops are "unisex."

Surgeon, Physician

Women were undoubtedly among the first healers and physicians in prehistoric times. As the ones responsible for gathering plant foods they were in the best position to develop detailed knowledge about plants, their cultivation, and their properties both nutritional and medical. Knowledge of the healing properties of plants was passed down through the centuries from mother to daughter in generations of wise women and folk healers, who were indeed the first physicians.

Medicine was one of the first sciences, and in the ancient period women studied in some of the earliest universities and medical schools such as the one in Heliopolis, Egypt in 1500 BCE. Two women physicians of ancient Greece, Lais and Sotira, wrote books on abortion and sterility.¹⁰

Hildegard of Bingen, an abbess in tenth century Germany, wrote a number of books and treatises that mark her as one of the great scientific minds of her time. "She not only dwelt upon spiritual matters but supplied theoretical explanations for observed phenomena in the physical world as well."¹¹ Two of her books, *Causae et curae* and *Physica*, covered a wide range of subjects, including anatomy, blood circulation, and the uses of plants, animals, and minerals for human health. She encouraged medical research at the convent she founded.

Italy was the most intellectually enlightened country during the Middle Ages, and upper class women were able to get excellent educations. There was a "long tradition of female medical scholars. In the 1300s, Constanza Calenda lectured on medicine at the University of Naples; Dorotea Bocci succeeded her father as the professor of medicine at the University of Bologna a century later."¹²

In some Italian towns where surgeons worked under the supervision of the faculty of medicine, there were women who were licensed to practice

surgery. In 1322, on the recommendation of the medical faculty of Salerno University, the court of Charles, duke of Calabria, ruled that Francesca, a married woman, was authorized to practice surgery after having been tested by the representatives of the faculty of medicine. According to the ruling not only did the law permit a woman to practice surgery, but it was even desirable, since for reasons of modesty it was preferable for women to treat women. The fact that women took their place among surgeons and apothecaries can also be learned from a document written in the thirteenth century to guide churchmen who tendered free treatment to poor patients who could not afford the services of academic physicians or even surgeons. The author of the book writes that he collected some of the prescriptions in his book from a woman surgeon and a female apothecary, the daughter of an apothecary.¹³

The witch-burnings raged throughout Europe during the 16th and 17th centuries, resulting in the torture and murder of up to 10 million, mostly women.¹⁴ Barbara Ehrenreich and Deidre English have suggested that one causative factor in the massacre was the Church's attempts to consolidate its power in the face of continuing pagan practices, particularly among the peasant class. Medicine as practiced by the traditional women herbalists and midwives competed directly with the Church-sanctioned emerging profession of physician. There were good reasons for the people to continue relying on their traditional healers. Women who delivered babies with midwives in attendance had much better survival rates than women who delivered in the new physician's hospitals, where it was believed that the benefits of hand washing were a myth. Doctors often went from one patient to another, and even from autopsies to deliveries without washing their hands.¹⁵

According to Ann Oakley, "women practiced with success and fame as surgeons, dentists, and oculists, and in allied fields"¹⁶ in England during the eighteenth century. Oakley attributes the decline of women in these professions during the nineteenth century to the growth of scientific knowledge and the increasingly "scientific" approach to medicine. As medicine continued to become more science based, the position of women, who were excluded from university training, became more difficult. At first, midwives were the most affected branch of the profession. Queen Victoria became the first ruler to employ a male midwife, and in the 1870s, "the Obstetrical Society of London (the predecessor of the Royal College of Obstetricians and Gynecologists) declared midwifery to be the branch of medicine for which women were the least fitted."¹⁷ Even in the Victorian era, which has become synonymous with modesty and restricted sexual mores, the older justification for women treating women fell before the advance of male territorial designs on a new profession.

In the early years of the American colonies, most medical treatment was provided by women, although "men monopolized the profession of physician."¹⁸ Katherine Hebdon was a well-known doctor in colonial Maryland, although it is unlikely that she had formal university training. Despite her skill and the fact that she was in business independently, "when it came to suing for nonpayment of fees, her husband, Thomas, had to take the case to court and demand the payment due *him* for medical services rendered by *his wife*."¹⁹

There were no legal restrictions on who could practice medicine in most states as late as 1875.²⁰ Women continued to practice medicine widely through most of the nineteenth century, although without the formal training available to male physicians. One example was Harriot Kezia Hunt, who practiced medicine with her sister Sarah beginning in 1835. Their early training was by an English couple who cured Sarah of an illness that had resisted the treatment prescribed by university trained physicians.

The two sisters trained themselves, relying on common sense and a belief that good nursing, proper diet, cleanliness, and rest would solve many health problems. As their practice grew they became increasingly impressed by the importance of mental health. Although they were uncredentialed and thus barred from hospitals, the sisters' practice nevertheless boomed, primarily among women and children.²¹

When Harriot heard that Elizabeth Blackwell had been admitted to a medical school, she petitioned the Harvard Medical School for permission to attend lectures, but was denied.

The first woman known to graduate from medical school did so in 1812 – but as a man. Dr. James Barry graduated from the Edinburgh College of Medicine at the age of 15 and pursued a military career until she retired in 1859. Barry was so successful in her disguise that her true identity as a woman was discovered only after her death in 1865 by a female servant who prepared the body for burial. Even then, her true name and origin was unknown. Dr. James Barry served as a medical officer in the British military with assignments all over the world, including South Africa where she introduced reforms including better sanitation and better treatment of slaves; her reforms often brought her into conflict with higher-ranking officers. Her final assignment was as the top-ranking medical officer in Canada.²² "Known for her strict standards of hygiene and diet of the sick, she also discovered, during her service in South Africa, a plant that was widely used to treat syphilis and gonorrhea before the advent of sulfa drugs half a century earlier."²³

The first American woman to earn a medical degree in the nineteenth century was Elizabeth Blackwell. Born in England, her family moved to the United States when she was 11. After teaching for seven years, she began applying to medical schools. She was rejected by one school after another, until she was admitted to Geneva College in upstate New York. Things didn't get any easier. She was ostracized by the townspeople and the college barred her from classroom demonstrations. She earned her degree in 1849, then studied abroad. Even with a degree, she encountered difficulties in starting a practice, so in 1857, she, with her sister Dr. Emily Blackwell and Dr. Marie E. Zakrzewska, founded the New York Infirmary for Women and Children. In 1859, after working to improve medical training opportunities for women in England, she became the first woman entered on the Medical Register of the United Kingdom. Continuing her work to expand medical opportunities for women in the United States, she and her partners founded the Women's Medical College of the New York Infirmary in 1868. The Women's Medical College continued under the directorship of Emily Blackwell until 1899, when Cornell Medical School began to admit women. After 1869, Elizabeth Blackwell continued her work in England. "Throughout her medical career, she emphasized the importance of hygiene and sanitation and criticized the excessive use of surgery."²⁴

Other medical colleges for women were founded in Philadelphia, Boston, New York, Chicago, and Baltimore; but because women were barred from hospitals, they could not get clinical practice except in the Blackwells' New York Infirmary. By 1859, about 300 women were licensed physicians.²⁵ In the 1890s, women's hospitals in New York, Philadelphia, Boston, Chicago, San Francisco, and Minneapolis employed women physicians.²⁶

The country's first woman surgeon was Mary Harris Thompson, "who earned her medical degree in 1863 and two years later founded the Chicago Hospital for Women and Children."²⁷ The first African-American woman to receive a medical degree was Rebecca Lee in 1864, who may have qualified as a nurse or midwife. The first African-American woman to earn her M.D. was Susan Smith McKinney Steward in 1870.²⁸

In 1869, the University of Michigan became the first public university to have a co-educational medical school. As a land grant university, it was required to offer all courses to any student regardless of gender. However, it dealt with the problems of propriety by offering duplicate courses ("his" and "hers") on the "embarrassing" subjects. Land grant colleges in Boston, Syracuse, and Buffalo followed suit in the next decade, and others fell in line after that. The American Medical Association began admitting women members in 1876. Johns Hopkins was the first eastern university to grant medical degrees to women, beginning in 1893. "Women pressed in where they could: by 1900, 42 percent of Tufts Medical School graduates were women."²⁹

By 1900, nearly 7,000 women were physicians. At the same time, the supply of doctors was greater than the demand, and as has frequently been the case in other trades, the shortage of jobs led to a backlash against women. Women's medical colleges closed, partly because their founders supported co-education, partly because their standards were considered to be lower than those of Johns Hopkins. Coeducational medical schools began limiting their quotas of women, as low as 5 percent in 1925. Less than 10 percent of general hospitals accepted women interns. At Boston University, 30 percent of the medical graduates were women in 1918; twenty years later, there was not one woman graduate. The percentage of women doctors fell from 6 percent in 1910 to 4.4 percent in 1930.³⁰

World War II created a shortage of physicians. Medical schools responded by recruiting women students and hospitals opened internships to them. They reverted to their previous quotas again after the war. With the women's movement of the 1960s and 70s, medical schools and hospitals were pressured to open their doors again to women. By the late 1970s, women comprised 10 percent of all physicians; by 1990 they were nearly 20 percent. Nevertheless, they continued to earn nearly half what male physicians earned, and they continued to be underrepresented on the faculties of medical schools.³¹

Postal Carriers, Telegraph and Telephone Operators

The growing fields of postal service, telegraphy, and telephone service provided significant employment opportunities to women in the late nineteenth and early twentieth centuries. In each case, men or boys were the majority of workers when the occupations were created, but employers soon realized that women could do the work as well for less money.

The postal systems of England and France expanded rapidly during the last two decades of the nineteenth century. "Between 1888 and 1895, the volume of letters carried by the French Post Office more than doubled, and the service could not find enough male workers to fill jobs as postal clerks."³² A few women had held these positions in provincial areas, but in most cases, they had inherited the position from a deceased father or husband. By 1892, however, the postal service was in desperate need of postal clerks whose duties were to sell stamps, weigh letters, and sort mail. It began to hire large numbers of women, especially in Paris. This development paralleled the increase in the numbers of women clerical workers in offices. The work of actually delivering the mail on foot remained a male job. England had a few women mail carriers. The first was Eliza Harris of Cobham, who "each working day had to tramp eighteen miles over muddy country roads."³³

Women on the western frontier of the United States established outstanding records of service as mail carriers. One was Doña Candelaria Mestas, who carried the mail by horseback between the New Mexican communities of Arboles and Rosa during the turbulent 1890s.³⁴ Another intrepid New Mexican mail carrier was Rosa Katherine "Grandma" Hilton, who took over the management of a ranch (and rode a horse for the first time) at the age of 58. "At the age of seventy-one, Grandma Hilton continued to carry the mail to some seventeen mountain families and neither crippled horses nor personal injuries slowed her down."³⁵ Just over the border, women were active in a wide variety of support activities during the Mexican Revolution, including mail delivery.³⁶

Alice Greenough, rodeo star in the 1930s and National Cowboy Hall of Fame member, grew up in Montana just after the turn of the century. One of eight children, Greenough learned early to be independent and work hard. One writer commented that "boys and girls seem to have been interchangeable in the Greenough family. When there was a job to be done – helping a neighbor with his hay – the closest child got the nod."³⁷ In an interview, Greenough described her experience as a mail carrier:

In 1917 my dad took a rural mail route out of Billings. But he had so much to do at home that I was his substitute. I was only fourteen years old. I was supposed to be eighteen to be bonded to carry mail, but I carried the mail route out of Billings thirty-seven miles by horseback every day for three winters and two summers. Everyday, even through forty-below-zero weather in the winter.³⁸

One mail carrier was a legend in her own time. Mary Fields was born a slave in Tennessee in 1832. Sometime after the Civil War, she made her way west to Montana, where in 1884 she found work as a freight hauler for the Ursuline nuns in Cascade. Six

feet tall and heavy; fast on the draw, and as strong as any man, she was as likely as any cowboy to settle her quarrels with a shoot-out. It was that tendency that caused her to lose her freight job. After an unsuccessful attempt in the restaurant business, she took a job as stagecoach driver on a mail route. She was in her sixties.

For upwards of eight years, she single-handedly ran a stageline in the dangerous Montana territory, regularly combating extremely inclement weather, fending off wild wolves, and earning a reputation for delivering the mail regardless of the weather, terrain or personal risk. If perchance her wagon would be bogged down or otherwise disabled, Mary would sometimes become prey to wild wolves for an entire night. At daybreak, the wolves would flee and Mary would hoist her mail bag on her shoulder, pick up her shotgun and walk the remaining miles to the next mail stop.

Mary Fields, who packed a .38 caliber pistol and whose courage and perseverance were astounding, became the second woman in United States history to deliver the U.S. mail³⁹

When she died in 1914, Mary Fields was one of the most beloved citizens of Cascade, Montana. Evidently she had mellowed some in her later years.

When the field of telegraphy got its start in the early 1800s, it was the general practice to hire boys to operate the lines, but women got into the field early on. The first woman telegraph operator in the United States was Sarah Bagley of Lowell, Massachusetts, who took the position when a station opened in Lowell in 1846. A native of New Hampshire, Bagley moved to Lowell around 1836 to work in the mills. According to Barbara Wertheimer, Bagley was "one of the most remarkable women of her day.... Agitator, labor organizer, journalist, public speaker, adult educator, abolitionist, and political activist... she believed all women workers should belong to labor unions and was the first to pressure a state legislature into holding public hearings on working conditions, as well as the first to initiate a political campaign by women."⁴⁰ In 1845, Bagley founded and became the first president of the Female Labor Reform Association.

After Bagley's start, women entered the field of telegraphy in increasing numbers; "by 1870 women had established themselves nation-wide in this field,"⁴¹ although they continued to earn about half of men's wages.

In the latter part of the nineteenth century, "a number of young western women learned telegraphy, and some served as station agents as well as telegraphers for the railroads."⁴² One such woman was Cassie Hill, whose husband worked for the railroad as station agent and telegrapher. They lived in the train depot in Roseville, California. When he died in 1884, Cassie was left with five children to support. She took over his job as Wells Fargo agent, and "was soon doing an extraordinary job for the company, both as express agent and as one of the first women telegraphers."⁴³

Women served as telegraph operators during wartime as well. During the Mexican Revolution, women worked as telegraph operators,⁴⁴ and Marion Taylor was the first U.S. woman to work as a telegraph operator for the military during World War I. As part of her work, she received secret reports of ship movements in the Atlantic.

The first commercial telephone exchange opened in 1878 in New Haven, Connecticut, two years after Alexander Graham Bell first exhibited the new invention. The earliest telephone operators were boys, as had been the case with telegraph operators. As Wertheimer notes, however, "employers soon discovered that young women could do the work just as well for less money. Within ten years almost all daytime exchanges were operated by women, though men and boys continued on the night shift until the early years of the twentieth century."⁴⁵

In the thirty years between 1870 and 1900, the census showed a tremendous jump in women's employment as telephone and telegraph operators, which were reported as one classification before 1900. In 1870, 350 women were listed as telegraph operators, comprising 4.3 percent of the industry's workforce. By 1900, 21,980 women were listed as telephone and telegraph operators, 29.3 percent. Most of this increase was in the telephone industry. Once they were reported separately, women's dominant numbers as telephone operators became clear. In 1902, there were 37,333 women telephone operators and 2,525 men; in 1907, there were 76,638 women and 3,576 men. Over 90 percent of these women were under the age of 20 and single. The industry wanted to preserve this growing occupation for "genteel" young women before they married. Wertheimer noted that

While the work may have been "genteel" – that is, sedentary and clean – it was far from easy. The women spent long workdays seated with their noses against large switchboard jacks into which they reached and stretched to fit the proper plugs. They took from 250 to 350 calls an hour. Supervision was rigid. Mistakes spelled disaster. A spy system helped the company maintain discipline, and women were not permitted to talk among themselves. Sanitary facilities often were poor, and the time allowed for using them was rigorously controlled.⁴⁶

While working conditions improved over time, many of the conditions described above continued well into the 1970s, and some intensified when computers were integrated into the telephone system.

Erna Schneider Hoover worked as a researcher at Bell Laboratories beginning in 1954. "There she developed and patented the first computer used to switch telephone calls.... Her patent, one of the country's first in the software field, and her general technical contributions to the widely used Electronics Switching Project of the Bell Telephone companies resulted in her becoming the first woman supervisor of a technical department at Bell Laboratories."⁴⁷ Hoover successfully combined a science career with marriage and raising a family of three. In fact, she drew up the first draft of her switch design while in the hospital after the birth of one of her children.

Office Occupations

Prior to the 1860s, most clerical work in offices was performed by men. The positions included a variety of tasks, and served as business apprenticeships with the promise of advancement into management. During the Civil War, the shortage of male workers led the Treasury Department to hire female clerks for the first time, but at wages significantly less than men's. At the same time, women began starting their own office support businesses, offering stenographic, bookkeeping, and accounting services. The introduction of the typewriter in the 1880s led to new employment opportunities for women as typists, and the "supply of literate male labor failed to meet the demand."⁴⁸

Schools offering inexpensive training for women in "business" skills opened in cities around the country. In 1917 the Smith-Hughes Act provided federal funding for vocational training in high schools; agricultural and industrial education were offered to boys; home economics and "business" (typing, stenography, and bookkeeping) were offered to girls.

The turn of the century saw women move into clerical occupations in large numbers, quickly coming to dominate the field. But as Dorothy and Carl Schneider note, women clerical workers found that

the ground shifted beneath their feet. When earlier on young men had dominated the occupation, clerical jobs had often led to upward mobility, acting as apprenticeships during which young men learned the business and trained for managerial roles. The feminization of offices coincided with de-skilling, breaking down tasks to their fundamentals, so that any one worker could easily replace another. Confined to one job in one department, women workers could hardly develop an understanding of the business. Moreover, even when they worked alongside male colleagues and did the same work, women did not enjoy the same access to promotion.⁴⁹

These shifts occurred in France and England at the same time as in the United States. There, changes in the economy resulted in the loss of women's jobs in textiles, but an increase in men's jobs in heavy industry. At the same time, however, "the scale of organization of the economy grew, [and] bureaucratic and administrative organization expanded. Clerks, typists, and secretaries were needed in increasing numbers to staff company offices and fill government positions."⁵⁰ Men were attracted by the high wages to jobs in heavy industry, creating a labor shortage in the clerical field. Once again, employers turned to women to fill the gap.

These changes created a vast new field of employment open to women. But as was the case in the United States, clerical positions were quickly de-skilled and lost their previous opportunities for advancement. The field quickly expanded, creating thousands of new jobs, and women moved to fill these positions, rapidly outpacing the entry of men into the field. Tilly and Scott report that

In England, fewer than 1 percent of the clerks were women in 1851. By 1914, women represented 25 percent of all commercial clerks. While the

number of male clerks increased fivefold between 1861 and 1911, the number of female clerks increased 400 times. (By 1951, women represented nearly 60 percent of all clerical office workers, and office work employed over 1.25 million women, the largest of any occupation.)⁵¹

The increase was even greater in the United States, where in 1900, 320,000 women held office jobs. In 1930, the number was 2 million, and had grown to 12 million women in 1980. By 1990, 80 percent of office workers in the United States were women, 18.4 million in all.⁵²

Part of this growth was fueled by the Depression. Women were disproportionately affected by layoffs in the early part of the Depression, but changes in the structure of work actually created more jobs for women in the later period. Businesses became more streamlined, many jobs were de-skilled by new technology, and businesses replaced expensive skilled workers with less expensive and less skilled people. Government projects that were part of the New Deal created many new clerical jobs that were mostly filled by women.⁵³

The trend continued after World War II. "Opportunities in office work bounded upward"⁵⁴ as the service sector expanded, creating more and more new jobs that were filled by women.

Bette Nesmith Graham
Invented Liquid Paper
United States
1924-1980

Bette Nesmith Graham left her mark on the business world by inventing and marketing Liquid Paper. The business started out in her kitchen, moved into her garage as it grew, and eventually developed into a multi-million dollar enterprise with international distribution – all because she was a poor typist.

Dropping out of high school at age seventeen, Bette applied for a job as a secretary, even though she couldn't type. The company hired her anyway, and sent her to secretarial school. She earned her high school diploma at night school, but she never did become very good at typing. That was a serious liability for a divorced, single mother with a child to support.

After watching a sign artist paint over lettering errors, she realized that she could hide her typing errors by covering them with white paint. Other secretaries in the company quickly saw the advantage of the idea, and Bette started selling them bottles of her homemade paint. As the product caught on, she was encouraged to try marketing it publicly in 1956.

Before applying for a patent, she worked at improving the formula. She consulted with a chemistry teacher at her son's school, and learned how to grind and mix paint from a man who worked at a paint company. When she had perfected a quick-drying,

undetectable paint, she offered it to IBM. The business giant declined, so she decided to market it herself. "By the end of 1957, Liquid Paper was selling a hundred bottles per month – bottles that were filled out of squeezable ketchup and mustard containers by [her son] and his friends in the family garage. After an article about the product appeared in a national office supply magazine, the hundreds of bottles became thousands of bottles."⁵⁵ Still, it took nearly ten years for the company to become profitable. "In 1968 Liquid Paper grossed more than \$1 million, producing in excess of ten thousand bottles a day."⁵⁶

When Bette Nesmith Graham retired in 1976, Liquid Paper employed 200 people and produced 25 million bottles annually, which were distributed in 31 countries. From her start as a poor single mother, she built a fortune based on her weakness.

Computers

In the last twenty years, computers have moved into the mainstream and transformed not only the fields of science and technology, but office work as well. Today, millions of women are using computers every day, but few are aware of the significant contributions women have made to the development of computer technology.

Ada Lovelace

Mathematician, Invented Concept of Computer Programming
England
1815-1852

Born in England in the early nineteenth century, Ada Lovelace was the only legitimate child of the poet Lord Byron. She had a remarkable mind, and was tutored at home in mathematics, astronomy, Latin, and music. She corresponded with some of the greatest minds in England, and they tutored her by mail as well.

After Lovelace met mathematical engineer George Babbage in 1834, she focused her studies on calculus and analysis. Babbage

had the idea of a "difference engine" (one that could add and subtract) long before he met Ada, and he devised the "analytical engine" (a legitimate precursor to the computer) without her assistance. But it was Ada who first designed the punch-card programs that would instruct the analytical engine in its tasks. It was she who conceptualized what this day and age refers to the law of GI/GO: Garbage In, Garbage Out."⁵⁷

Those punch-cards formed the world's first computer program, and punch-cards continued to be used in computer programs and data entry well into the twentieth century.

Grace Murray Hopper
Mathematician, Revolutionized Computer Programming Software
United States
1906-1992

Rear Admiral Grace Murray Hopper was an associate professor of mathematics at Vassar when she joined the Naval Reserve in 1943. Her first assignment was with the Navy's Bureau of Ordnance Computation Project during World War II. In that position, she became the third person ever to program the Mark I, the world's first large scale digital computer. After the war she worked on UNIVAC, the first large scale commercial computer.

At that time, computer programmers had to start from scratch, writing complex instructions for machine operation with every new program they created. Hopper wondered about creating a computer "compiler," a program that would do the basic work with many different programs. Most programmers believed it couldn't be done, but Hopper's compiler succeeded in changing the way software was written. She is also credited with the creation of COBOL, the most widely used business computer language. COBOL is still in use today.

Hopper retired from the Navy in 1966, but was called back the next year to coordinate the standardization of all Navy computer operations.⁵⁸

Rodeo

For many ranch daughters, rodeo was a natural place to use their well-honed skills. During the early years of rodeo, women competed in a variety of events; sometimes they even competed against the men.

Both rodeos and Wild West shows got their start in 1882.⁵⁹ One of the first known rodeos to award prizes was held that year in Pecos, Texas, although rodeo-like events had been around since 1847.⁶⁰ The first Wild West show was started by William F. (Buffalo Bill) Cody in North Platte, Nebraska; the next year it developed into Buffalo Bill's Wild West Show. Neither the rodeo nor the Wild West show of 1882 featured women performers or contestants, but it wasn't long before women were an integral part of these events.

Annie Oakley joined Buffalo Bill's Wild West Show in 1885. Nicknamed "Little Sure Shot," she thrilled audiences with her dazzling displays of target shooting. Within two years of Oakley's debut, twelve more women joined the troupe. Their acts included a variety of riding displays.

Buffalo Bill's Wild West Show was phenomenally successful, and according to one historian, there were at least 116 other shows built around the same concept.⁶¹ One was organized in 1899 by Colonel Zack Mulhall, an Oklahoma rancher with an extremely

talented family. His daughter Lucille was far and away the most talented of the lot. According to Joyce Gibson Roach,

Lucille Mulhall was the first and undisputedly the best woman steer roper rodeo ever witnessed. She competed in all the early contests against men and often beat them. Because women were given no special stock or favors, and because the event was also a part of real ranch work, it was one of the favorite events of both cowboys and cowgirls.... Steer tying was an event in which women excelled, and that they excelled seems an unlikely thing because the steers were large and the women small. Steer tying, not to be confused with calf roping, pitted a mounted roper against a steer. The rider would approach the running steer, throw the loop and "gather the horns," roping just the horns of the steer. Casting slack to the right side of the saddle horn the roper would ride to the left at a forty-five degree angle. The steer, upon hitting the end of the rope, would be jerked off its feet. While the horse kept the slack out of the rope by dragging the steer, the roper would dismount and tie him with the usual three wraps and a hooley, a half-hitch to secure the wrap.⁶²

Mulhall began performing in the family show when she was ten years old. When the show closed after fifteen years, she went on to star in other rodeos and Wild West shows. For most of her performing years, she was the undisputed champion woman roper and bronco rider in the country. She was also the first to be called "cowgirl," a title bestowed on her by Theodore Roosevelt after he saw her perform in 1900. Thanks to her popularity, "cowgirl" became a household word. Buffalo Bill called her the "greatest cowgirl on earth."⁶³ Mulhall's "popularity as a cowgirl was not entirely due to her skill, although her skill was awesome, the result of perfect timing with her rope and unusual balance on her horse."⁶⁴

Wild West Shows continued their popularity until World War I. When the Wild West Shows closed, many of their performers moved into rodeo. In rodeo competition, women "roped calves and steers, vied in relays and barrel races, rode bulls and bareback broncs, and did trick riding."⁶⁵

The first records of women participating in rodeos date from 1896, when Annie Shaffer of Arkansas rode a bucking horse at the Fort Smith rodeo, and 1897, when Bertha Kaepernick rode broncs and entered a wild horse race.⁶⁶

The first cowgirl to rival Mulhall's reputation was Tad Lucas. Born in 1902, she was the youngest of twenty-four children born to the first white settlers in Cody, Nebraska. Lucas's specialty was trick riding, and because of her small size, she was "especially good at back drags and going under the belly of the horse"⁶⁷. Starting in 1925, she won the trick riding championship at Cheyenne for seven years. She also won All Around Champion and Trick Riding Champion at Madison Square Garden for eight years, the only person to hold a title for that long.⁶⁸

The heyday of women in rodeo was in the 1920s and 1930s, but the prize money for women began to disappear in the late 1930s. The Depression and the high expense of travel and transportation of horses, combined with the low numbers of women

competitors (compared to the numbers of men) brought about the demise of women's events in major rodeos.

In 1942 the Madison Square Garden replaced the women bronc riders with "sponsors" – young women chosen to represent the western states in the grand entry and to ride the barrel race. The move was contested by regular competitors, who complained that these "sponsors" had more glamour than talent, and that some of them could hardly ride. The change was significant, and marked the first acceptance of barrel racing (running a cloverleaf pattern around three barrels) on a national basis. Barrel racing became the only women's event remaining on the major rodeo circuit. For the next few years, women who wanted to compete in other events were limited to local jackpot events.⁶⁹

Cowgirls decided to take matters into their own hands in the late 1940s and formed the Girls Rodeo Association (GRA), which sponsored all-women rodeos. "In 1948 the GRA had 74 members and staged one rodeo. In 1979 it had close to two thousand members and sanctioned fifteen all-girl shows."⁷⁰ The GRA changed its name to the Women's Professional Rodeo Association (WPRA) in 1981. Official WPRA events include bareback bronc riding, bull riding, ribbon roping, breakaway roping in which the calf is roped but not tied, steer undecorating, and barrel racing. There are two categories of barrel racers: those who race only in rodeos staged by the Professional Rodeo Cowboys Association and whose only event is barrel racing; and those who also compete in other events as well as the all-women shows. The descendants of the early rodeo cowgirls and the "glamour girls" of the 1940s have become serious professional athletes.

Bullfighting

Although bullfighting is not related to rodeo, it is worth noting here that women have succeeded in that strongly male bastion. One writer noted that "Latin American women were among the greatest riders and cattle handlers ever."⁷¹ An illustration dating from 1846 shows a woman in Rio de Janeiro fighting a bull while seated on a horse.

The first woman to become a great bullfighter was Conchita Cintron, born in 1922 in Chile of Puerto Rican and Irish-American parentage. Her family moved to Peru when she was a year old. Her career started early:

At the age of 12 in Lima she made her first public appearance on horseback as a *rejoneadora* and over the next decade "applied" herself, as the term is, to more than 800 bulls from horseback. At 15, meanwhile, in Mexico, she also appeared for the first time as a *torera*, fighting a bull on foot. She became famous and extremely popular in South America. But in Portugal and Spain she had a long struggle before she was allowed to fight bulls as a *torera* and in France was summoned to court for having "mistreated a domestic animal." (The charge, she said, was insulting to the bull.) In 1949, appearing on horseback in a bull ring in Spain, she defied the rules by dismounting, led the bull through a perfect set of passes, then dropped her sword, choosing not to kill. Two other bullfighters who appeared that afternoon dedicated their bulls to her. She was arrested but pardoned on

the spot at the demand of the crowd, then left the ring and never returned.⁷²

A Spanish woman, Maria de los Angeles was denied a license by the Spanish Bullfighter's Union until the Supreme Labor Court of Spain ruled in her favor in 1974.⁷³ She was followed by Maribel Atienzar, who was known as *La Niña Torera*, the "baby bullfighter." Atienzar began fighting at the age of 14 and by 17 she had killed 35 bulls. "At first her mother objected, feeling that the sport was more fitting for Maribo's brother, Palo. But 'bullfighting is my life,' the daughter insisted. Palo [became] La Niña's manager, organizing her bookings in the corridas of Spain."⁷⁴

American-born Aracelli Gonzalez had never seen a bull fight until her father took her to one in Guadalajara, Mexico, when she was nineteen. "I knew immediately it was what I wanted to do," she said. She dropped out of college, joined the bullfighter's union and began training. She fought her first bull as a novice matadora less than a year after that first bullfight she witnessed in Guadalajara 1994. In entering the male world of bullfighting, Gonzalez encountered much less resistance than the women who preceded her. Some attribute this to changes within Mexican society: machismo appears to be on the decline as more married women go to work. Gonzalez' goal is to complete the novice period and become a full-fledged bullfighter, who can then fight in other countries with bullfighting traditions. That's when success really begins for a matadora.⁷⁵

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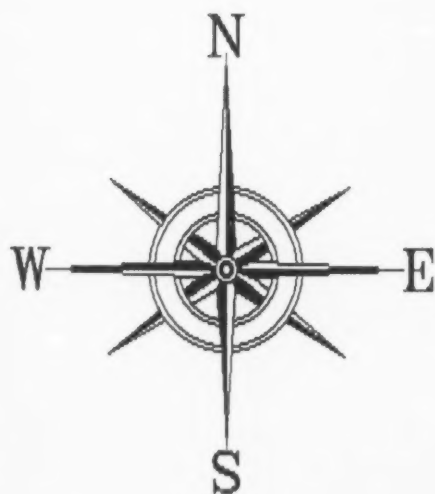
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Reference List

Significant Women and Their Contributions

**Trade/
/Page Woman**

Contribution

Agriculture

5	Prehistoric Women	Invented agriculture
15	Native American Women	Developed many of the world's major food crops
22	Eliza Lucas Pinckney	Developed indigo, the major cash crop in the Southern colonies
29	Homesteaders	Single and widowed women file 20% of claims; 30% of land in Dakota
40	Eleanor A. Ormerod	Agricultural entomologist
41	Henrietta Chamberlain King	Ranch manager, developed only true American cattle breed
42	Harriet Williams Strong	Invented water conservation dams
43	Alice Evans	Discovered cause of Brucellosis, disease spread through milk
44	Rachel Brown and Elizabeth Hazen	Discovered 1st major anti-fungal drug

Manufacturing Overview

65	Prehistoric women	Invented first tools in most tool categories
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Metal and Heavy Industries

92	Mary Carpenter Hooper	Inventor of industrial machinery
93	Helen Augusta Blanchard	Inventor of industrial machinery
93	Margaret E. Knight	Inventor of industrial machinery
97	Lizzie Dickelman	Invented and marketed sheetmetal grain storage devices

Lumber and Wood Products

- | | | |
|-----|--|--|
| 108 | Eleanor P. Vance and
Charlotte Vale | Woodworkers; founded Biltmore Industries
and Tryon Toy-Makers |
|-----|--|--|

Leather and Fur

- | | | |
|-----|-----------------------|---|
| 118 | Native American Women | Made possible the survival and success of the
European fur trade |
|-----|-----------------------|---|

Food Processing

- | | | |
|-----|-------------------------|--|
| 124 | Melitta Bentz | Invented drip method of coffee brewing |
| 125 | Margaret Fogarty Rudkin | Founded Pepperidge Farm bakery |
| 125 | Nicole-Barbe Clicquot | Invented process for clarifying champagne;
helped build champagne industry |
| 126 | Amanda Theodosia Jones | Invented vacuum canning method of food
preservation |
| 127 | Mary Engle Pennington | Made refrigeration a viable technique for
food storage; revolutionized food
industry |

Printing

- | | | |
|-----|------------------------|---|
| 134 | Mary Katherine Goddard | Printer; printed first copies of Declaration of
Independence |
|-----|------------------------|---|

Miscellaneous Industries

- | | | |
|-----|--------------------------|--|
| 147 | Katharine B Blodgett | Invented nonreflecting glass |
| 149 | Betsy Metcalf, Mary Kies | Invented techniques that were basis of
American straw bonnet industry; one
of few economically stable industries
in early 1800s |

Construction Trades

- | | | |
|-----|-------------------------|--|
| 151 | Women in Pompeii & Rome | Plumbers and brickmakers |
| 155 | Emily Warren Roebling | Central figure in building Brooklyn Bridge |
| 157 | Tabitha Babbitt | Invented circular saw and cut nails |
| 158 | Kate Gleason | Invented housing developments |
| 158 | Francis Gabe | Invented self-cleaning house; "innovativeness so advanced" |

Architecture

- | | | |
|-----|-----------------|--------------------------------------|
| 165 | Mother Joseph | First architect in Pacific Northwest |
| 167 | Julia Morgan | Designed Hearst Castle |
| 168 | Eleanor Raymond | Designed 1st passive solar house |

Engineering

- | | | |
|-----|---------------|-----------------------------------|
| 171 | Maria Telkes | Pioneer in solar power |
| 171 | Hertha Ayrton | Preeminent expert on electric arc |

Mining

- | | | |
|-----|----------------|--|
| 174 | Miners | Women worked underground in mines in Europe |
| 178 | Nellie Cashman | First woman prospector in Alaska |
| 180 | Carrie Everson | Invented oil flotation method for separating minerals from ore |
| 182 | Alice Hamilton | Founded field of industrial toxicology |

Land Transportation

- | | | |
|-----|-------------------|--|
| 207 | Bullwhackers | Hauled Freight |
| 209 | Clara Brown | Wagon train owner; transported former slaves |
| 210 | Charlie Parkhurst | Stage coach driver |

Shipping

- | | | |
|-----|--------------------|---|
| 191 | Hsi Kai Ching Yih | Greatest pirate of all time |
| 193 | Mary Becker Greene | Riverboat captain |
| 195 | Eleanor Creesy | Clippership navigator |
| 196 | Hannah Burgess | Clippership navigator; commanded for 3 weeks |
| 197 | Mary Ann Patten | Clippership navigator; commanded for 52 days |
| 201 | Martha J Coston | Invented maritime signal flares |
| 203 | Hazel Zuckerman | Sailor, instrumental in getting women back on merchant marine ships |

Rail Transportation

- | | | |
|-----|----------------|--|
| 219 | Mary E. Walton | Invented way to deaden sound of elevated railroads |
| 220 | Olive Dennis | Invented climate control system for trains |

Motor Transportation

- | | | |
|-----|---------------------|---|
| 224 | Joan Newton Cuneo | Race car driver |
| 225 | Alice Huyler Ramsey | "Woman motorist of the century" |
| 226 | WW I relief drivers | Drove ambulances & provided relief services |
| 230 | Mary Anderson | Invented windshield wiper |

Aviation and Space

- | | | |
|-----|---------------------------------|--|
| 233 | Women's Airforce Service Pilots | Delivered aircraft, towed targets in WW II |
| 234 | Jerrie Cobb & 12 other woman | Qualified for astronaut training, 1960 |
| 234 | Barbara Crawford Johnson | Manned space flight program support |
| 235 | Lillian Greneker | Manufactured rubber fuel tanks in WW II |
| 235 | Irmgard Flugge-Lotz | Developed theory for automatic flight control - made jet planes possible |
| 236 | Gertrude Rogallo | Co-inventor of flexible wing, hang glider |

Military

- | | | |
|-----|-------------------------|---|
| 239 | Boudica | United Celtic tribes against Roman invaders |
| 240 | Zenobia | Controlled nearly all the territory conquered
by Alexander the Great |
| 240 | Kahinah | United northern Africa in 7th century |
| 241 | Zinga | Resisted Portuguese colonialism in Africa |
| 241 | Chaka | Created Zulu nation |
| 242 | Hong Xuanjiao | Led women's army in Taiping Revolution |
| 243 | Aethelflaed | Paved way for unification of England |
| 246 | Jennie Rodgers | Longest term of service by woman in Civil
War |
| 247 | Dr. Mary Edwards Walker | Surgeon in Civil War, 1st woman to receive
Medal of Honor |
| 248 | Woman Chief | 3rd highest ranked Crow chief |

Miscellaneous Professions

- | | | |
|-----|----------------------|--|
| 260 | Mary Fields | Mail carrier, stage driver |
| 264 | Bette Nesmith Graham | Invented Liquid Paper |
| 265 | Ada Lovelace | Invented concept of computer programming |
| 266 | Grace Murray Hopper | Revolutionized computer programming
software, created COBOL |

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